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# AUTOMOTIVE INDUSTRIES

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## This Week

On page 8 there are some most interesting figures on labor turnover in the automotive industry. A five year analysis of monthly employment in car and parts factories gives a long-time picture of the subject.

This month's production feature was garnered from the efficient plant where engines for the GMC trucks are made. For accuracy and speed of production a goodly number of intriguing shortcuts have been developed. You will enjoy reading about them. The article starts on page 12.

## Second Quarter Near Record

**Estimated Production of 1,453,297 Exceeded Only in '29; Retail Deliveries Continue High**

By Harold E. Gronseth

The motor industry closed the first half of 1936 with an estimated output of 2,570,000 cars and trucks for a gain of 15 per cent over the 2,329,521 units turned out in the first six months of 1935. If the same rate of increase is held throughout the last half of the year, 1936 will finish with an output in excess of 4,737,000 units.

Preliminary estimate indicates that June production approximated 445,000 vehicles comparing with 480,571 in May and 372,085 in June last year.

The persistently strong retail demand extending into summer prompted a number of plants to step up their June operating rate. Ford went back to a five-day basis and others boosted their original schedules.

The industry went into the second half of the year with little change in its production rate. The major producers have scheduled a July output only slightly smaller than the volume turned out in June and it looks now like the industry's total for the current month will top the 400,000 unit mark.

Nine months of heavy production have brought output of current models to roughly 3,750,000 vehicles and July's contribution will bring the total to well over 4,100,000. The 1936 model run should range between 4,400,000 and 4,500,000.

On the basis of the June estimate, production in the second quarter this year reached 1,453,297 vehicles, a mark exceeded only once before the corresponding period. That was in the rec-

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## New Act Sets Labor Standards

**Walsh-Healey Bill Provides 40-Hour Week, Minimum Wages, for Work on Government Contracts Over \$10,000**

Establishing the principle of the eight-hour day, 40-hour week for all concerns receiving government contracts, the Walsh-Healey Bill was rushed through both houses of Congress just before adjournment and became law when the President signed it on June 30. Under the provisions of the act, any firm doing business with the government in excess of \$10,000 must comply with the stipulations which are set forth.

In effect, the Government Contracts Act reestablishes a blanket code for practically all major industries and for every concern which aspires to do a large scale business with the government. From the moment that a given company seeks government contracts for its products, the entire range of its operation are subject to the code. Considerable modifications were made since the original Walsh Bill came before the House. It covered all contracts, however small, and applied the retroactive principle of automatically barring all concerns which had not maintained the old N.R.A. standards. No such provision is contained in the bill finally passed.

In addition to maximum hour re-

quirements, the bill requires that the contractor must be a manufacturer of, or regular dealer in the product which he sells. Thus the so-called practice of "bid peddling" is eliminated.

The Secretary of Labor has been made responsible for the administration of the act as well as for certain discretionary powers incorporated within its terms. Most important is the provision for wage control which authorizes the Secretary of Labor to determine prevailing minimum wages "or persons employed in the industry or similar industries operating in the locality." The flexibility of this provision is at once apparent, and every company operating within its jurisdiction must meet the minimum standards.

The child labor clause applies only to the manufacture or production of the materials furnished in the contract, and provides that no female under 18 years of age and no male under 16 years may be employed. Convict labor is also excluded under this provision.

The final clause prohibits unsanitary, hazardous or dangerous work-

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## Steel at Lackawanna

**Schuyler and Grate Hosts at Opening of Bethlehem's New Mill**

The formal opening of Bethlehem Steel Corp.'s new continuous strip-sheet mill at Lackawanna, N. Y., took place on Tuesday, June 30, before a group of about 60 representatives of leading newspapers and magazines. A special train brought the invited guests from New York to Buffalo where they were joined by visitors from other cities for the carefully planned inspection tour.

The new plant, designed for the production of sheets, strip and light metal plates, adds approximately 600,000 gross tons to the annual capacity of the Lackawanna mill which already had approximately 3,000,000 tons capacity. The new buildings cover 67 acres of ground and required 17,000 tons of

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Chevrolet's parts packages win prize for third time

### Chevrolet's Parts Packages Win Award for Third Time

For the third successive year, the automotive industry has been awarded recognition for achievements in a field that until recently was occupied exclusively by manufacturers of popular-priced articles of merchandise. This recognition came to the Chevrolet Motor Co. when it won the Irwin D. Wolf Award for Distinctive Merit for 1936 in the American Management Association's sixth packaging exposition, held recently in New York. The award was for the design of containers for motor parts entered by Chevrolet and judged by the jury to be the most effective group of packages placed on the market during 1935.

The containers used by Chevrolet are canisters and boxes in which are packed such parts as armatures, spring shackles, distributors, coils, and other items that formerly were sold direct from bulk supplies kept in parts bins. A distinctive feature of the packages is their photographic labeling, showing an exact illustration of the contents.

In 1934, Chevrolet won an award in the All American Packaging Competition, and last year won an American Management Association award.

### George H. Kelly

Funeral services were held this week in Cleveland for George H. Kelly, 59, vice-president and treasurer of the White Motor Co., following his sudden death in his home in Shaker Heights.

Mr. Kelly had been associated with White since 1915. He was largely responsible for the introduction of White equipment in the Allied armies during the World War. White trucks were

later declared standard Class A equipment for the U. S. Army with the light weight ambulance standard for the Marine Corps, largely through Mr. Kelly's efforts.

Mr. Kelly was a graduate of Princeton University and received his law degree from Western Reserve University. He was admitted to the Ohio bar in 1900 and after practicing for several years left his profession to become secretary of the Baker-Raulang Co.

### NLRB Order Against Fruehauf Nullified by Federal Court

In an opinion handed down Tuesday in Cincinnati, the Federal Circuit Court of Appeals nullified the action of the National Labor Relations Board in its ruling against the Fruehauf Trailer Co. of Detroit. The company early this year appealed the ruling of the N.L.R.B. which directed the Fruehauf company

to "cease and desist" from discharging or threatening to discharge any employees for joining a union and to reinstate with pay employees already discharged.

In its brief opinion the court said that authority for the act "is claimed under the commerce clause of the Constitution."

"Since the order is directed to control and regulation of relations between the trailer company and its employees in respect to their activities in the manufacture and production of trailers and does not directly affect any phase of any interstate commerce in which the trailer company may be engaged. . . the Congress has no authority or power to regulate or control such relations between the trailer company and its employees and the N.L.R.B. was without authority to issue the order," the opinion continued.

### Rubber Union Leaders Ask End of Strike Epidemic

Akron tire manufacturers will enjoy a respite from sit-down strikes which have plagued them for many weeks, if unionist rubber workers adhere to the admonition of officials of the United Rubberworkers of America, issued to them at a special mass meeting June 28, that they end the Akron sit-down epidemic pending the union's renewed attempt to organize tire builders at Gadsden, Ala. The Akron mass meeting was addressed by the president and by eight U. R. A. organizers, all of whom had been severely beaten by several hundred Gadsden rubber workers when they went to that city to attempt to form a Gadsden union.

The union appeal for peace in Akron came as Goodyear ended its second week since last February free of interruption by sit-down unionist employees. Since the end of the five weeks' Goodyear strike late in March the company has had more than 20 separate sit-down strikes. The first of 30 Goodyear unionist employees charged with inciting riot, has gone on trial. Three other Goodyear employees await trial on grand jury indictments charging assault with intent to kill.

## Tires Up 10% for Car Makers

*Original Equipment Prices Raised by the Four Leading Rubber Firms; Retail Lists Unchanged*

Original equipment tire prices were increased an average of 10 per cent on July 1 by the four manufacturers supplying this market, Goodyear, Goodyear and Firestone, in Akron, and U. S. Rubber, in Detroit. The exact amount of the increase varies slightly according to the various types of tires, but averages approximately 10 per cent. Retail tire price lists remain unchanged.

This price increase for original tire equipment is the first for more than a

year. It became necessary, according to rubber manufacturers, because of the steadily rising costs of raw material. The price of crude rubber has been going up continuously for the past year and is now 15 to 16 cents a pound.

Special inducements offered during the July 4 holiday period by mail order houses, such as free tube offers, are not disturbing the price stability of the retail market, according to Akron advisers.



# Bendix Settles Labor Dispute

*Wage Increase Demanded by Union Is Submitted to Study;  
Union Recognition Left to Courts*

Amicable settlement of differences between the management and the union last Monday averted a threatened strike at the Bendix Corp. plant in South Bend, which, had it materialized, would have interfered with the start of new model production of the many car manufacturers supplied by Bendix.

The United Automobile Workers International Union had demanded a wage increase of 10 cents an hour for all employees, but accepted the management's proposal to make a thorough study of the question in September, when the 1937 contracts are approved and to grant at that time whatever increases are possible according to their findings. Company made the concession of paying employees weekly instead of every two weeks. This change becomes effective immediately.

Recognition of the union as the sole bargaining agency of employees was left to the courts to determine, since Bendix already has been granted an injunction against the holding of an election in the plant for that purpose. Whether the labor board will carry the case to a higher court is not known. The company declined to change seniority rights. Officers of the U.A.W. are to serve on the bargaining committee and a shop committee has been created to deal with grievances. The management insisted on dealing with representatives of any group, recognizing the rights of the minority as well as the majority. Present union strength at the Bendix plant is an unknown quantity. At the U.A.W. convention in South Bend last April, the plant had nine and a fraction representatives, indicating union membership in excess of 900 workers out of 3800 in the plant, representation

being on the basis of one for every 100 members.

This was the first clash between management and the International since it was put on its own by the A. F. of L. at the April convention, and is regarded by observers as the opening gun in the union's drive for membership. Adolph Germer, representative of John L. Lewis and the Committee for Industrial Organization, is understood to have been in South Bend during the controversy advising union leaders. Homer Martin, International president sat in on the conferences.

Although Bendix is regarded as one of the key plants of the industry, it is a question just how successful the union would have been if a strike had been called. Company officials said that a majority of their employees had signified their desire to continue at work. No doubt it would have caused considerable hardship to the company and its employees, with some delay to customers. But sources of car manufacturers are now so well scattered that labor trouble at any one plant, while causing some delays, would not tie up the industry as it might have done a few years ago.

## Gar Wood Industries Builds Rear-Drive Motor Coaches

Gar Wood Industries, Inc., is now manufacturing a new line of 20 and 24 passenger streamlined motor coaches. Prices range from \$4,500 to \$5,200, depending on the interior seating equipment and accessories.

Welded tubular steel is used for the entire structural framework. There is no separate chassis frame, the body unit

serving as both body and chassis frame in one integral section. All mechanical parts are attached directly to the body unit. The engine is placed at the rear instead of at the front or side. Light weight, economy of operation, smoother riding qualities, less noise, no inside fumes or odors, better driving vision, and quicker acceleration are some of the features claimed for the new type of construction.



**CHARLES W. FRANCE** has been named vice-president and general manager of the Curtiss-Wright Airplane Co., Robertson Mo., according to an announcement from the Curtiss-Wright Corp. Mr. Wright, formerly with Western Air Express and Eastern Airlines, will have full charge of the St. Louis plant.

**PAUL S. STRECKER** has been appointed personnel director at the Grand Rapids stamping division plant of General Motors Corp. Mr. Strecker has conducted executive training courses at General Motors Institute of Technology, for Buick, Pontiac, G. M. Truck, Oldsmobile, AC Spark Plug and for Chevrolet at its Flint, Saginaw, Detroit and Muncie plants.

**KENNETH B. ELLIOTT**, for several years a member of the executive staff of the Studebaker Corp., was elected a vice-president at a meeting of the board of directors last week. Mr. Elliott will be assistant to the president, Paul G. Hoffman, a position he has held since 1930.

## Black & Decker Labor Difficulties Concluded

Labor difficulties at the Kent, Ohio, plant of the Black & Decker Electric Co., were satisfactorily concluded as a result of a series of joint conferences held over the week-end. A mutually satisfactory agreement was reached June 29, between the management of the company and the shop committee.

The terms of the agreement were approved by the membership at a special meeting held the following day. Both sides to the controversy made concessions for the purpose of reaching an agreement and the result is entirely satisfactory to both. The office force and foremen were immediately called into the plant and arrangements are being speeded to condition it for the resumption of operations.

## Cleveland Twist Drill Co. Begins New \$400,000 Plant

Plans for a new \$400,000 plant to be constructed by the Cleveland Twist Drill Co. were announced this week. Three buildings totaling 40,000 sq. ft. will be razed and will be replaced by the new structure encompassing 106,000 sq. ft.



Gar Woods Industries, Inc., employs the progressive assembly system in producing its new rear-drive coaches.

# Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

General business activity continued to be well maintained last week, showing few signs of the seasonal recession that usually occurs at this time of year. Several important industries operated at or near the high levels for the year to date, and retail trade showed wide margins of gain over last year's figures, due in part, apparently, to the effects of the veterans' bonus.

## Guaranty Trust Index

The index of business activity of the Guaranty Trust Co. for May stands at 82.2, as against 82.9 for April and 71.5 for May, 1935. The company's wholesale price index for June 15 is 54.1, as compared with 53.3 a month earlier and 54.5 a year ago.

## Carloadings Hold Gains

Railway freight loadings during the week ended June 20 totaled 690,716 cars, showing an increase of 3904 cars above the total for the preceding week, a gain of 123,667 cars above that for the corresponding period last year, and an increase of 67,394 cars above that two years ago.

## Power Reaches New High

Production of electricity by the electric light and power industry of the United States in the week ended June 20 reached a new high record, exceeding the total of 2 billion kilowatt-hours for the second time in the history of the industry. The current figure is 13 per cent above that reported a year ago.

## Oil Output Steady

Average daily production of crude petroleum during the week ended

June 20 amounted to 2,963,400 bbl., showing a decline of 8000 bbl. from the output of the preceding week but exceeding the total of 2,838,300 bbl. calculated by the United States Department of the Interior to be the total of the restrictions imposed by the various oil-producing States during June. Output a year ago averaged 2,728,300 bbl. daily.

## Life Insurance Sales Rise

Sales of ordinary life insurance in May were 1 per cent greater than those a year ago. This is the first month since November, 1935, that sales have shown an increase over the total for the corresponding month of the preceding year. Sales in the first five months of the year were 11 per cent below those for the similar period in 1935.

## Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended June 27 stands at 82.6, as against 82.5 a week before, 82.3 two weeks before, and 81.2 three and four weeks before.

## Federal Reserve Statement

Bills discounted by the Federal Reserve banks declined \$1,000,000 during the week ended June 24. Open market purchases and holdings of government securities showed no change, while other Reserve bank credit declined \$8,000,000. Member bank reserves increased \$414,000,000, with a decline of \$451,000,000 in Treasury cash and deposits with the Federal Reserve banks, an increase of \$125,000,000 in money in circulation, and a rise of \$57,000,000 in the monetary gold stock.

## Dardelet Screw Thread Approved by Air Bureau

According to an official communication from the Bureau of Air Commerce of the Department of Commerce, the Dardelet self-locking screw thread employed for bolts and nuts and other threaded parts where a locking device is required, is approved for use in licensed aircraft, provided that the parts are manufactured by a licensee of Dardelet Threadlock Corp. under terms of license agreement and that the parts are fabricated from materials specified by the aircraft manufacturer

in his approved technical data.

Dardelet threaded parts are subject to inspection as integral parts of the aircraft being inspected for license.

## Americans Comment on Mexico's New Highway

The new international highway between Mexico City and Nuevo Laredo on the American border is to be inaugurated July 1. The highway compares favorably with trunk roads in the United States according to Thomas J. MacDonald, chief of the U. S. Bu-

reau of Highways, and Pyke Johnson, vice-president of the Automobile Manufacturers Association, who recently covered the 762 miles in 26 hours. High compliments to the Mexican engineers, especially for the mountainous construction, was paid by Mr. MacDonald at the end of the trip.

Pyke Johnson, vice-president of the Automobile Manufacturers Association, and George F. Bauer, manager of the association's export department, left this week for Mexico as members of the official delegation named by Secretary of State Hull to represent the United States at the ceremonies dedicating the opening of the Mexico City-Nuevo Laredo 770-mile section of the Inter-American Highway this week.

## Canadian Sales in May Up 15% Over Year Ago

Canadians bought more new cars in May than a year ago, recent Government reports indicate. There were 19,093 vehicles sold for \$19,273,600 in May, an increase of 15 per cent in number and 18 per cent in value over May, 1935. Of these, 15,854 were passenger cars which sold for \$16,105,325 compared with 13,856 units sold for \$13,495,025 a year ago. British Columbia and Saskatchewan were outstanding among the provinces with increases in number of cars sold of 40 and 30 per cent, respectively. Passenger car sales during the first five months of 1936 numbered 51,598, or 9 per cent greater than in the same period of 1935. There were 10,709 commercial vehicle sales at \$10,595,278 compared with 9068 at \$9,162,770 last year.

## 40 Years Ago

with the ancestors of  
AUTOMOTIVE INDUSTRIES

## Foreign Notes

A Paris manufacturer of motor vehicles has received an order for half a dozen motor ambulances to be used in the Indian service.

The Locomotives on Highways Bill has reached its second reading in the House of Commons and has been referred to the standing committee on law.

D. Farman, a young mechanical engineer of Paris, has just published a book of over 300 pages on motor vehicles.

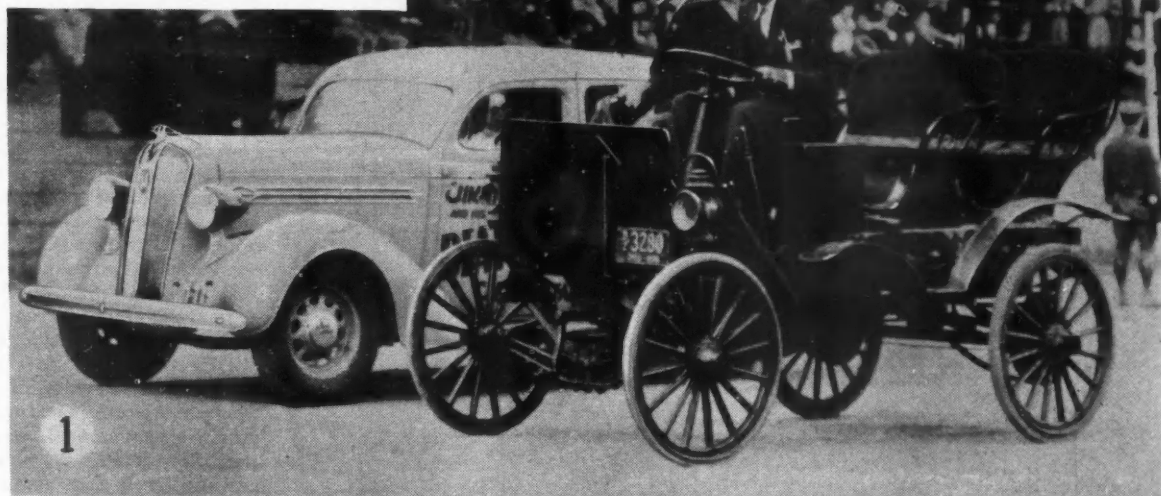
M. Mors, an electrical inventor of Paris, is building a 3¼-hp. petroleum motor which has electric ignition, but without batteries, the spark being furnished by a small dynamo operated by the motor itself. By mean of this arrangement, M. Mors claims he is able to run his motor at 1000 r.p.m.

—From *The Horseless Age*, July, 1896.



# The WORLD on WHEELS

1. Contrasts at the Texas Centennial Exposition's automobile rodeo



Fox photo



2. Sliding roofs equip the fleet of 2200 taxicabs just placed in service in New York.

3. An asbestos blanket fire extinguisher, carried in a small tube in the car, is being tested in England.

4. Portable air conditioner, mounted on a truck, pumps cleansed air, cooled in summer and warmed in winter, into planes about to leave the Chicago airport.

5. Motorized convoys are becoming a familiar sight. (Left) The New Jersey National Guard recently took delivery of 15 trucks in Detroit. (Right) New York National Guardsmen start a drive-away of 48 trucks.



## Second Quarter Near Record

(Continued from page 1)

ord year 1929. Two other quarters of that same year also went higher, the first and third. Total for the three months just ended compared with 1,117,125 units turned out in the first three months this year and 1,230,953 in the second quarter of 1935.

There was little slackening in the swift pace of retail deliveries as the first half of 1936 ended. Figures for the final reporting period are not yet available but indications are that June finished strong. Chevrolet expected to set a new monthly sales record. Several other companies were running ahead of May. The industry as a whole, however, should be slightly under its May volume which exceeded 455,000 units, or less than 1000 under the peak month of April. The drop from April was in truck deliveries which were down some 3000 units while passenger car deliveries actually ex-

ceeded those of April by over 2000.

Factory sales of Hudson and Terraplanes totaled 7600 cars during the first 25 days of June which, the company reports, represents a 50 per cent gain over the same period a year ago.

Retail deliveries of Studebaker in the United States totaled 4638 units, while factory sales amounted to 5052, an increase of more than 100 per cent over the 1935 figures for that period.

## New Act Sets Labor Standards

(Continued from page 1)

ing conditions, and states that compliance with the laws of the state in this regard will be prima facie evidence of compliance with the provision. Important, however, is the fact that this clause alone applies to "any part of the contract" and thus governs subcontractors as well as primary contractors.

That the bill will have little effect

on the automobile industry with regard to maximum hour requirements is shown by the fact that according to figures of the Department of Labor, the average weekly hours in the automobile industry are 32½; in foundries and machine shops, 40½; in blast furnaces and rolling mills, 37½, and in the tire and tube industry, 33.

## ASME Announces Nominations Of Officers for Next Year

Nominations for officers of the American Society of Mechanical Engineers for 1937 were announced at a recent meeting of the nominating committee held at Dallas, Tex., during the semi-annual meeting. Election will be held by letter-ballot of the entire membership and will close on Sept. 22, 1936.

The nominees are: for president, J. H. Herron, president of the James H. Herron Co., Cleveland, Ohio; for vice-presidents, J. A. Hall, professor of mechanical engineering, Brown University, Providence, R. I., J. M. Todd, consulting engineer, New Orleans, La., and R. J. S. Pigott, staff engineer in charge of engineering, Gulf Research and Development Corp., Pittsburgh, Pa.; for managers, E. W. Burbank, manager Dallas district, Allis-Chalmers Mfg. Co., Dallas, Tex., K. H. Condit, editor, *American Machinist*, McGraw-Hill Publishing Co., New York, N. Y., and S. W. Dudley, dean of engineering, Yale University, New Haven, Conn.

## Harvard Makes 15 Awards To Traffic Study Bureau

Harvard University's Bureau for Street Traffic Research has awarded 15 fellowships of \$1,200 each for study during the next academic year. Six of the recipients are members of police departments, five are traffic experts. Nearly all are on leave of absence from official positions.

These men will join with other staff members and students in a scientific study of all phases of automobile accident and traffic problems. Two graduate courses included in the curriculum will cover the principles and problems of street and highway traffic control. The fellowships are made possible through grants from the automotive industry.

## Perfect Circle Employees Get Week's Paid Vacation

All employees in the Hagerstown, New Castle, Tipton, Ind., and Toronto, Canada, plants of the Perfect Circle Co. are to receive a week's vacation with pay, according to announcement by the management. The vacation period for the United States plants begins July 4 and the Canadian plant Aug. 1. This is the third successive year that Perfect Circle employees have been given a vacation without loss of pay.

## At the Luncheon-Recess

during the meeting of the board of directors of the N.S.P.A. held on June 25 at the Book-Cadillac Hotel in Detroit.

L. F. Woolman, Allen Electric & Equipment Co., Kalamazoo, Mich.; L. G. Matthews, Sealed Power Corp., Muskegon, Mich.; R. D. Black, Black and Decker Mfg. Co., Towson, Md.; and W. H. Richardson, Timken Roller Bearing Service & Sales Co., Canton, Ohio.



F. C. Kip, Automotive Thrust Bearings Corp., Chicago, Ill.; H. A. Lightner, DeLuxe Products Corp., La Porte, Ind.; F. A. Miller, U. S. Asbestos division, Raybestos-Manhattan, Inc., Manheim, Pa.; A. C. Darling, Borg Warner Service Parts Co., Chicago, Ill.



## Steel at Lackawanna

(Continued from page 1)

steel in foundations and superstructures, all of which was rolled and erected by Bethlehem's own personnel. More than 18,000 tons of machinery and equipment have been incorporated within the mill, and the benefit to outside industries is exemplified by the expenditure of \$3,796,311 for electrical equipment alone.

A luncheon at the Wanakah Country Club followed the plant inspection tour. Here Charles M. Schwab, chairman, and Eugene G. Grace, president of the company, addressed the group informally. Mr. Schwab's talk was filled with reminiscences of his 56 years in steel and he described the business as a "three-legged stool supported by management, capital and labor" unable to stand without each other.

Describing the achievement accomplished in building the new \$20,000,000 plant, Mr. Grace said that employment at the Lackawanna plant now exceeded the 1929 average by 2000 men. Justifying the company's step in building the new mill, he pointed out that strip and sheet production in 1935 amounted to 33 per cent of the total as compared with only 15 per cent in 1926.

In reemphasizing the part that both their own and other industries had played in building the new mill, Mr. Grace pointed out that the plant construction had furnished 1,150,465 man-hours of work for the company's own workers, to say nothing of the thousands who had benefited in other industries. "The significant fact," he said, "is that this is an example of how our well-being, whether we be employer or employee, is dependent upon the investment of capital.

"But we recognize that capital must have reasonable encouragement to make such an investment. Before they will put their money to work to develop and maintain business enterprise, which is the key to prosperity, investors must feel reasonably sure that their

investment is not going to be undermined by legislative onslaughts in the form of excessive taxation or inimical laws that prevent efficient, orderly and harmonious conduct of business. I am glad to see that the sound reasoning of American opinion is becoming alive to this.

"Whatever the real cause may have been for the years of depression which

followed 1930, variously attributed to an aftermath of the World War, to an over-extension of credit, world economic and other conditions—whatever the cause, I am certain of one thing: It is the revival of American enterprise and initiative which is restoring us to a sound healthy condition. It seems to me that in seeking a basis for recovery and the reemployment of those who are employable, that we should remember that our years of industrial progress are built upon individual enterprise.

"The pent-up demand arising out of deferred maintenance, rehabilitation, replacement of obsolete machinery in productive industry, and new construction requires investment of many billions of dollars."

### Pew and Hall to Represent API at Power Conference

J. Edgar Pew, of the Sun Oil Co., Philadelphia, and Edwin S. Hall, of the Standard Oil Co. of N. J., New York, have been named as delegates from the American Petroleum Institute to the Third World Power (Fuel) Conference to be held at Washington, D. C., Sept. 7 to 12.

Electric Auto-Lite Co. will pay 30 cents a share on common stock and \$1.75 a share on preferred stock on July 1 to holders of record June 15.



Air view of the new continuous strip-sheet mill built by the Bethlehem Steel Co. at Lackawanna, N. Y., which was inaugurated June 30.

Mill stands Nos. 2, 3 and 4 of the roughing train at Bethlehem's new Lackawanna mill with the finishing train of the mills in the background. The roughing train reduces the thickness of the slabs from 4½-5 in. to somewhere between ⅝ and 1¼ in.

### Revised Motor Vehicle Production for 1935 \* U. S. and Canada

1935	Passenger Cars	Trucks	Total Motor Vehicles
January .....	235,806	64,529	300,335
February .....	287,142	63,204	350,346
March .....	377,374	70,520	447,894
April .....	407,721	69,338	477,059
May .....	322,485	59,324	381,809
June .....	306,300	65,785	372,085
July .....	283,715	61,582	345,297
August .....	186,133	58,942	245,075
September .....	59,499	33,229	92,728
October .....	220,113	60,203	280,316
November .....	347,830	60,720	408,550
December .....	353,688	64,629	418,317
Total .....	3,387,806	732,005	4,119,811
1936			
January .....	309,535	67,771	377,306
February .....	235,669	65,205	300,874
March .....	358,011	80,981	438,992
April .....	437,380	90,346	527,726
May .....	401,896	78,675	480,571
Total .....	1,742,491	382,978	2,125,469

\* The monthly production table published in AUTOMOTIVE INDUSTRIES, May 30, 1936, contained revisions for the United States only. The above table has been revised for both U. S. and Canadian plants.

# Labor Turnover in the Automotive Industry

## A Five-Year Analysis of Monthly Employment in Car and Parts Factories

Monthly labor turnover in automobile and body plants as contrasted with the automotive parts industry are given in the accompanying tables. In both industries the annual quit rate was higher in 1935 than in 1931 and 1932, while the discharge rate for last year fell off sharply after a steady rise from 1932. Lay-off rates were lowered in many cases to below the 1932 level. Thus total separation for 1935 was the lowest of any of the five years. Only in 1931 and 1932 were the accession rates higher than the operation rates.

Comparison of the monthly figures show the varying seasonal as well as annual trends. Highest quit rate of the five years was March, 1934, while lowest was October, 1932. In 1933, lay-off rates reached the maximum in March and October while in 1935 the peak came in August.

The table immediately following brings the comparison up-to-date through February, 1936, the latest available data.

Month	Quit rate									
	1935		1934		1933		1932		1931	
	Auto-mob- iles and bodies	Auto- mobile parts	Auto-mob- iles and bodies	Auto- mobile parts	Auto-mob- iles and bodies	Auto- mobile parts	Auto-mob- iles and bodies	Auto- mobile parts	Auto-mob- iles and bodies	Auto- mobile parts
Year.....	15.56	13.36	22.21	19.47	14.50	15.99	10.06	8.99	13.11	11.01
January.....	1.96	1.14	2.81	2.60	0.88	1.61	1.05	1.11	0.87	0.73
February.....	1.68	1.16	3.15	3.02	0.53	0.60	0.82	0.84	0.88	0.65
March.....	1.72	1.30	3.36	3.33	0.62	0.33	2.15	0.50	1.23	1.32
April.....	1.96	1.33	3.28	2.84	0.84	0.87	1.34	0.61	1.55	1.58
May.....	1.38	1.18	2.46	2.20	1.10	0.99	0.78	0.98	1.33	1.41
June.....	0.99	0.82	1.59	1.09	1.23	1.47	0.64	1.02	1.02	0.94
July.....	0.73	0.77	1.21	0.91	1.41	1.50	0.61	0.61	1.13	0.97
August.....	0.70	0.70	0.95	0.89	1.58	1.51	0.65	0.54	1.11	0.70
September.....	0.76	0.93	0.58	0.64	2.46	1.41	0.62	0.49	1.05	0.70
October.....	1.19	1.35	0.80	0.61	1.29	3.22	0.31	0.59	0.85	0.80
November.....	1.42	1.26	0.67	0.60	1.18	1.08	0.57	0.55	0.89	0.64
December.....	1.07	1.42	1.35	0.74	1.38	1.40	0.52	1.06	1.20	0.57
Discharge rate										
Year.....	3.21	3.94	4.68	4.90	4.81	3.91	2.65	1.92	3.99	3.83
January.....	0.34	0.39	0.61	0.63	0.45	0.30	0.31	0.38	0.25	0.27
February.....	0.29	0.31	0.64	0.66	0.32	0.19	0.29	0.25	0.28	0.31
March.....	0.29	0.34	0.60	0.96	0.18	0.10	0.47	0.14	0.49	0.54
April.....	0.37	0.31	0.69	0.71	0.31	0.25	0.18	0.10	0.48	0.62
May.....	0.34	0.28	0.51	0.43	0.35	0.28	0.18	0.15	0.35	0.51
June.....	0.22	0.17	0.40	0.29	0.54	0.38	0.15	0.10	0.25	0.23
July.....	0.21	0.25	0.28	0.21	0.58	0.38	0.11	0.09	0.36	0.16
August.....	0.19	0.21	0.21	0.23	0.48	0.43	0.14	0.06	0.34	0.23
September.....	0.12	0.20	0.14	0.14	0.38	0.33	0.15	0.06	0.25	0.22
October.....	0.26	0.42	0.19	0.15	0.58	0.40	0.19	0.12	0.31	0.22
November.....	0.33	0.61	0.10	0.21	0.31	0.43	0.24	0.17	0.27	0.28
December.....	0.25	0.45	0.31	0.28	0.33	0.44	0.24	0.30	0.36	0.24
Lay-off rate <sup>1</sup>										
Year.....	51.46	58.71	90.41	92.64	77.65	76.12	86.16	87.02	74.14	56.18
January.....	1.50	2.14	2.87	4.15	3.58	4.37	3.85	4.37	3.23	4.59
February.....	2.14	2.80	2.49	1.49	13.15	13.28	2.37	7.44	1.83	2.06
March.....	2.05	4.91	3.53	4.69	15.98	14.67	5.09	6.60	1.79	1.60
April.....	1.95	5.56	3.95	5.66	2.25	2.76	4.99	13.50	1.93	2.04
May.....	6.06	5.39	11.42	13.95	1.53	1.51	4.79	6.09	2.86	3.97
June.....	9.64	11.95	9.63	13.27	1.53	1.63	4.10	6.36	9.03	9.14
July.....	4.76	7.87	8.32	7.09	3.49	1.50	13.65	12.68	6.51	7.82
August.....	13.84	5.54	11.13	11.55	3.38	3.55	10.03	11.35	3.04	6.91
September.....	2.30	2.09	16.79	14.70	8.31	9.58	18.04	5.41	12.28	4.23
October.....	2.39	2.13	13.92	9.45	16.55	15.11	8.86	5.40	21.63	6.78
November.....	2.85	4.62	4.21	4.49	4.37	5.29	6.99	2.63	7.33	3.98
December.....	1.98	3.71	2.15	2.15	3.53	2.87	3.40	5.19	2.68	3.06
Total separation rate										
Year.....	70.23	76.01	117.30	117.01	96.96	96.02	98.87	97.93	91.24	71.02
January.....	3.80	3.67	6.29	7.38	4.91	6.28	5.21	5.86	4.35	5.59
February.....	4.11	4.27	6.28	5.17	14.00	14.07	3.48	9.53	2.99	3.02
March.....	4.06	6.55	7.49	8.98	16.78	15.10	7.71	7.33	3.51	3.46
April.....	4.28	7.20	7.92	9.21	3.40	3.88	6.51	14.21	3.96	4.24
May.....	7.78	6.85	14.39	16.58	2.98	2.78	5.75	7.22	4.54	5.89
June.....	10.85	12.94	11.62	14.65	3.30	3.48	4.89	7.48	10.30	10.31
July.....	5.70	8.89	9.81	8.21	5.48	3.38	14.37	13.38	8.00	8.95
August.....	14.73	6.45	12.29	12.67	5.44	5.49	10.82	11.95	4.49	7.84
September.....	3.18	3.22	17.51	15.48	11.15	11.32	18.81	5.96	13.58	5.15
October.....	3.84	3.90	14.91	10.21	18.42	18.73	9.36	6.11	22.79	7.80
November.....	4.60	6.49	4.98	5.30	5.86	6.80	7.80	3.35	8.49	4.90
December.....	3.30	5.58	3.81	3.17	5.24	4.71	4.16	6.55	4.24	3.87
Accession rate										
Year.....	84.90	91.61	144.23	125.23	116.59	124.64	81.17	81.79	79.95	64.05
January.....	16.74	19.51	25.78	24.81	11.11	7.99	10.33	8.03	4.42	4.99
February.....	5.36	7.58	19.59	22.61	3.59	3.04	4.03	4.99	6.26	7.42
March.....	5.86	4.04	15.51	18.45	4.43	3.41	6.07	2.98	8.14	9.57
April.....	5.54	3.32	13.22	6.75	11.99	14.33	7.77	4.18	5.28	6.84
May.....	1.98	2.36	4.52	3.81	8.56	9.41	9.94	5.38	3.26	3.95
June.....	2.01	2.90	3.42	2.87	15.16	14.18	7.81	3.21	3.74	1.32
July.....	2.39	4.40	2.09	3.71	12.48	12.33	2.16	3.19	4.21	2.25
August.....	3.39	6.88	2.39	1.80	5.73	9.61	2.00	3.73	2.80	4.53
September.....	10.49	12.98	2.88	2.53	6.16	7.04	4.15	6.79	4.62	3.31
October.....	19.19	12.94	7.00	4.45	5.66	6.21	8.44	5.50	4.09	4.35
November.....	7.89	7.79	20.89	13.16	11.74	20.36	7.99	18.12	17.52	6.59
December.....	4.06	6.91	26.94	20.28	19.98	17.90	10.48	15.69	15.61	8.93

<sup>1</sup>Including temporary, indeterminate, and permanent lay-offs.

### Automobiles and Bodies

	1936	1936	1935
Quit rate .....	.70	.86	1.68
Discharge rate .....	.15	.25	.29
Lay-off rate .....	3.29	4.80	2.14
Total separation rate....	4.14	5.91	4.11
Accession rate .....	3.77	2.34	5.36

### Automobile Parts

	1936	1936	1935
Quit rate .....	.88	1.07	1.16
Discharge rate .....	.34	.36	.31
Lay-off rate .....	5.46	6.53	2.80
Total separation rate....	6.68	7.96	4.27
Accession rate .....	2.99	3.61	7.58

All figures are from the Bureau of Labor Statistics, Department of Labor.

## More Allis-Chalmers Building; Blackhawk Mfg. Co. to Expand

Allis-Chalmers Mfg. Co., Milwaukee, which recently appropriated approximately \$1,000,000 for enlargement of capacity of its track-type and other heavy duty tractor works at Springfield, Ill., has now decided to build extensions costing about \$400,000 to the farm and light duty tractor plant at its main works in West Allis, suburb of Milwaukee. Output at both plants has been running short of demand for nearly a year, and the permanent improvements have been voted in view of the promising future for both heavy and light tractors.

Blackhawk Mfg. Co., 120 North Broadway, Milwaukee, manufacturer of



hydraulic automotive jacks ranging from one to 75 tons, will increase its production area from upwards of 100,000 sq. ft. early in July to more than three times that figure when it transfers its operations to the former plant of the Kempsmith Mfg. Co., at North Forty-fifth and West Rogers Streets, in suburban Milwaukee. Contracts have been let for remodeling and building a small warehousing addition.

### Rubber Consumption Up 29% Slightly Below April Peak

Crude rubber consumption in the United States was estimated at 50,482 long tons, a decrease of 2.7 per cent from the all-time record established in April, but 29 per cent above the corresponding month last year, according to the Rubber Manufacturers Association.

Imports of crude rubber for May were estimated at 35,600 tons, 32.5 per cent above May, 1935, and 11.8 per cent below April, while rubber afloat to U. S. ports is reported at 48,860 tons.

Domestic stocks totaled only 248,317 tons as of May 31, compared with 264,228 on April 31 and 322,559 on May 31, 1935.

### Goodyear to Experiment with Rubber Growing in Costa Rica

Goodyear Tire & Rubber Co., of Akron, through its subsidiary, Goodyear Plantations, Inc., has secured governmental concessions permitting the leasing of a large tract of land in Costa Rica, for crude rubber growing experimental purposes. Approximately 1000 acres of rubber tree seedlings will be planted. The concession is for 20 years and relieves Goodyear of all import and export taxes. The Goodyear development in Costa Rica follows a similar project in Panama. The company has extensive rubber plantations in production in Sumatra and Java.

### Page Upholds Autocar's Factory Branch System

To provide a competent service organization in the field for the highly specialized needs of heavy duty truck transportation is the chief reason behind the Autocar Co.'s factory branch system, according to Robert P. Page, Jr., president of the company, who recently addressed a meeting of the National Federation of Sales Executives. In addition to their service functions, Mr. Page explained that the branches also provided the most satisfactory means of meeting the very specialized problems which the heavy duty truck sales engineer must be prepared to handle.

In no way detracting from the conventional independent dealer set-up which sells virtually all passenger cars and 90 per cent of the trucks, Mr. Page pointed out that Autocar had adopted the factory branch system rather by  
(Turn to page 32, please)

## Higher Priced Cars Gain Most

**\$1,000 to \$1,500 Class Up 77% in Wholesale Group, 153% in Retail Group; Truck Output Rises**

### Passenger Car Production by Wholesale Price Classes U. S. and Canada

First five months 1936 and 1935 compared

	1936	1935	Per Cent Change	Per Cent of Total 1936	Per Cent of Total 1935
\$500 and under .....	946,003	969,176	- 2.2	54.29	59.44
\$501-\$750 .....	704,297	599,245	+17.6	40.42	36.75
\$751-\$1,000 .....	64,769	42,624	+52.0	3.72	2.61
\$1,001-\$1,500 .....	20,396	11,525	+77.0	1.17	.71
\$1,501-\$2,000 .....	4,586	4,114	+11.7	.26	.25
\$2,001-\$3,000 .....	2,251	2,382	- 5.5	.13	.15
\$3,001 and over .....	189	1,462	-87.1	.01	.09
Total .....	1,742,491	1,630,528	+ 7.1	100.00	100.00

### Truck Production by Capacities U. S. and Canada

First five months 1936 and 1935 compared

	1936	1935	Per Cent Change	Per Cent of Total 1936	Per Cent of Total 1935
1½ tons and less .....	361,396	307,790	+17.3	94.36	94.15
2 to 3 tons .....	15,690	14,591	+ 7.5	4.10	4.46
3½ tons and over .....	3,323	2,837	+17.1	.87	.87
Special and buses .....	2,569	1,697	+51.5	.67	.52
Total .....	382,978	326,915	+17.1	100.00	100.00

### U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—March

#### UNITS

#### ESTIMATED DOLLAR VOLUME\*

	1936		Per Cent Change	Per Cent of Total		1936	1935	Per Cent Change	Per Cent of Total	
	1936	1935		1936	1935				1936	1935
Chevrolet, Ford and Plymouth .....	198,031	185,334	+ 7.0	65.74	70.90	\$119,400,000	\$117,700,000	+ 1.8	57.43	64.46
Others under \$750 .....	41,677	35,408	+ 17.8	13.83	13.54	30,100,000	25,400,000	+ 18.5	14.48	13.91
\$751-\$1000 .....	47,034	33,776	+ 39.3	15.61	12.92	39,190,000	28,600,000	+ 36.8	18.81	15.66
\$1001-\$1500 .....	12,473	5,044	+147.5	4.14	1.93	14,300,000	6,100,000	+134.5	6.88	3.34
\$1501-\$2000 .....	985	755	+ 30.6	.33	.29	1,700,000	1,300,000	+ 31.0	.82	.71
\$2001-\$3000 .....	647	737	- 12.1	.21	.28	1,700,000	2,000,000	- 15.0	.82	1.10
\$3001 and over .....	409	367	+ 11.4	.14	.14	1,600,000	1,500,000	+ 6.8	.76	.82
Total .....	301,256	261,421	+ 15.1	100.00	100.00	\$207,900,000	\$182,600,000	+ 13.9	100.00	100.00
Miscellaneous .....	16	56	- 71.4							
Total .....	301,272	261,477	+ 15.1							

### U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—First Three Months

#### UNITS

#### ESTIMATED DOLLAR VOLUME\*

	1936		Per Cent Change	Per Cent of Total		1936	1935	Per Cent Change	Per Cent of Total	
	1936	1935		1936	1935				1936	1935
Chevrolet, Ford and Plymouth .....	462,324	404,441	+ 14.6	66.65	71.15	\$278,600,000	\$256,100,000	+ 8.9	58.28	64.33
Others under \$750 .....	93,355	76,481	+ 22.0	13.46	13.45	67,300,000	54,900,000	+ 22.6	14.08	13.79
\$751-\$1000 .....	104,553	71,178	+ 47.0	15.07	12.52	87,000,000	60,300,000	+ 44.2	18.20	15.15
\$1001-\$1500 .....	28,475	11,281	+153.5	4.10	1.98	32,700,000	13,900,000	+135.5	6.84	3.49
\$1501-\$2000 .....	2,259	2,271	- 0.5	.33	.40	3,900,000	3,800,000	+ 2.5	.82	.95
\$2001-\$3000 .....	1,608	1,822	- 11.9	.23	.32	4,200,000	5,000,000	- 16.0	.88	1.26
\$3001 and over .....	1,099	1,000	+ 9.9	.16	.18	4,300,000	4,100,000	+ 5.0	.90	1.03
Total .....	693,673	568,474	+ 22.0	100.00	100.00	\$478,000,000	\$398,100,000	+ 20.0	100.00	100.00
Miscellaneous .....	49	253	- 80.7							
Total .....	693,722	568,727	+ 22.1							

\* All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volume for the different models are then consolidated by price classes.

## Saginaw Stamping Builds Tourist-Trailer Chassis

Saginaw Stamping & Tool Co., Saginaw, Mich., which has been engaged in the automobile trailer field for the past two years, has built about 5000 one-wheel trailers and has recently entered the house-trailer field from the equipment standpoint.

One of its latest products is a house trailer chassis comprising a well-trussed steel frame mounted on coil springs and provided with hydraulic shock absorbers inclosed with the springs. The undercarriage is said to be very rigid in itself and to require no special bracing in the body superstructure. It is said to be specially adapted to the construction of collapsible house cars and for vehicles used for sales-promotion purposes which must carry considerable loads.

Each wheel of this trailer undercar-

riage is independently sprung, which eliminates the axle, and is said to have the advantage of giving greater road clearance.



A chassis for tourist trailers, featuring independent wheel suspension, has recently been introduced by the Saginaw Stamping & Tool Co. The chassis will be assembled in plants established sectionally throughout the U. S.

this week to make up earlier in the week for what turns would be lost because of the holiday. Transition to a somewhat slower pace is looked for from now on, but expected to be gradual.

**Pig Iron**—Middle Western markets report a certain amount of tapering-off in the takings of iron by automotive foundries. The market is quotably unchanged.

**Aluminum**—Steady and unchanged. **Copper**—While June sales, amounting to around 15,000 tons, were disappointing, producers are cheered by the rate at which copper continues to be consumed, which is generally estimated to be at the rate of 60,000 tons a month. This brings measurably nearer the time when consumers must again enter the market to replenish their reserves. The "outside" market is quoted at 9.35 cents, with the producers' price 9½ cents, delivered Connecticut.

## Automotive Metal Markets

### Steel Producers Determined to Resist Outside Interference With Their Labor Relations Policies

By William Crawford Hirsch

The statement made public on Monday by the American Iron and Steel Institute, setting forth in behalf of the country's steel producers a program of determined resistance to outside interference with their labor relations policy, came in for sympathetic interest in the steel market, without arousing the least uneasiness on the part of consumers over possible interruptions in deliveries.

This development came at a time when automobile manufacturers and parts makers, because of the third quarter price advances, had contracted for round tonnages of such descriptions of steel as could be ordered without risk of a change in specifications and on the eve of the interlude between old and new model production. Moreover, confidence that, no matter what might happen before or after the election, steel producers would be able to maintain the flow of material to consumers was expressed on all sides.

Mechanical improvements in steel mill equipment, which have just been added to by the going into production of an automatic strip-sheet mill in the Buffalo district, with a capacity of 600,000 tons a year, have so completely changed the picture of the steel industry since its earlier labor troubles that conditions are entirely unlike what they were then.

While in some descriptions of rolled steel, mills are striving hard to clean up what obligations they still have at second quarter prices, some of the strip mills have a backlog, sufficient to insure to them a more even operating rate this month and next than they would have had if they had worked at an unusually high rate in June. Auto-

motive alloy steel specialists continue to operate at a satisfactory rate. Some of the finishing mills made every effort

## Calendar of Coming Events

### SHOWS

International Automobile Section, 7th Levant Fair, Bari, Italy	Sept. 6-21
Automobile Salon, Oriental Fair, Lwow, Poland	Sept. 5-15
30th Automobile Salon, Paris, France	Oct. 1-11
Olympia Motor Show, London, England	Oct. 15-24
Czechoslovakia, 26th International Automobile Exposition, Prague	Oct. 16-25
9th International Automobile Salon, Milan, Italy	November
National Motor Truck Show (N. J. Motor Truck Assn.), Newark, N. J.	Nov. 3-7
National Automobile Show, Grand Central Palace, New York	Nov. 11-18
International Aviation Show, Paris, France	Nov. 13-29
Boston Automobile Show	Nov. 14-21
Columbus Automobile Show	Nov. 14-20
Chicago Automobile Show	Nov. 14-21
Detroit Automobile Show	Nov. 14-21
Washington, D. C., Automobile Show	Nov. 14-21
Cincinnati Automobile Show	Nov. 15-21
St. Louis Automobile Show	Nov. 15-22
Brooklyn Automobile Show	Nov. 21-28*
Cleveland Automobile Show	Nov. 21-28
Kansas City Automobile Show	Nov. 21-29*
Milwaukee Automobile Show	Nov. 22-29
Baltimore Automobile Show	Nov. 26-Dec. 5
28th Automobile Salon, Brussels, Belgium	Nov. 28-Dec. 9

\* Tentative dates.

Peoria Automobile Show	Nov. 30-Dec. 5*
Philadelphia Automobile Show	Nov. 30-Dec. 5*
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City	Nov. 30-Dec. 5
Automotive Service Industries Joint Show, Chicago	Dec. 9-14

### CONVENTIONS AND MEETINGS

Mid-Summer Convention of Automotive Trade Association Managers, Montreal, Que.	July 28-30
National Association Power Engineers, Annual Meeting, Chicago	Aug. 31-Sept. 4
American Chemical Society, Semi-annual Meeting, Pittsburgh, Pa.	Sept. 7-12
World Power (Fuel) Conference, Washington, D. C.	Sept. 7-12
American Transit Association, Convention, White Sulphur Springs, W. Va.	Sept. 21-24
First Aircraft Production Meeting of the S. A. E., Los Angeles	Oct. 14-16
American Society for Metals, 18th Nat'l Congress, Cleveland, O.	Oct. 19-23
16th Annual Meeting of the American Welding Society, Cleveland, O.	Oct. 19-23
American Gas Association, Annual Meeting, Atlantic City	Oct. 26-31
American Petroleum Institute, Annual Meeting, Chicago	Nov. 9-12
National Foreign Trade Convention, Chicago	Nov. 18-20
Natl. Industrial Traffic League, Annual Meeting, New York City	Nov. 19-20



# Just Among Ourselves

## Akron Is Proud —And Sorry

"AKRON rightly may be proud of the fact that she cradled the pneumatic tire industry, but right now Akron is far from proud of the fact that she also patterned a new vogue in labor protests through the passive-resistance or 'sitdown' strike."

This quotation is from a letter written by a correspondent who lives in Akron and who has probably about as intimate a knowledge of affairs in the rubber capital as anyone we know.

There are two very interesting aftermaths of the Akron strike epidemic. One is an illustration of a recurrent phenomenon: that when strikes become annoying to the populace at large, public opinion becomes a powerful weapon against the labor unions and is finally moved to do something about it.

Tire manufacturers with headquarters in Akron have increased their manufacturing capacity in plants outside the Akron area by at least 25,000 casings per day, according to a current estimate. This is a second direct result of the strike epidemic, and is due in no small measure to pressure from automobile manufacturers, who have informed the three leading suppliers of tires for original equipment that sources of supply must be guaranteed by the establishment of production facilities outside Akron.

Naturally, public opinion in Akron is concerned with decentralization of the tire industry, which threatens to wipe out a respectable portion of purchasing power going to the city's

merchants, and to increase the number of unemployed who must be taken care of by city authorities.

\* \* \*

## Non-Union Men Claim Rights Too

NON-UNION workers have joined the movement to "apply tourniquets" to Akron's bleeding body economic and the right to work has been given prominence by those who want to, as being of at least equal importance to a number of other rights which are being claimed by the malcontents.

"Sit-down" manifestations have extended even to sports events in Akron. One of the tire-company baseball teams forfeited a game because there was a non-union worker on one of the teams. A few incidents like that will probably do as much to wean public sympathy from the unions as anything could: because it's ridiculous, and the American people can still laugh; because it's poor sport, and the crowd hates to be cheated of its game.

\* \* \*

## Dealers Push State Codes

STATE codes of fair-trade practice, implemented by state legislation, will be sought by automobile dealers in many other states besides Wisconsin, according to the present look-out. A movement similar in intention has begun in Louisiana, and there is considerable talk among dealers elsewhere about the possibilities involved.

## Walsh-Healey Act May Be Irksome

AUTOMOBILE manufacturers do not seem greatly concerned about the Walsh-Healey Act, signed this week by the President, except for the possibility that its provisions may be broadened to swing a heavier club on bidders for government business. Automobile manufacturers who want government business should have no difficulty complying with the provisions of the Act as it stands, but compliance with an act which represents an attempt to constitutionalize a discredited system of codes presents some mental hazards.

\* \* \*

## Bendix Plant Is "Wired for Sound"

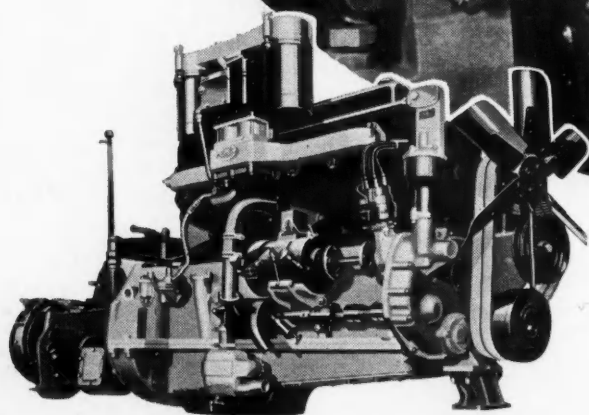
BENDIX has laid the physical groundwork for a rather interesting experiment in employee relations. At the South Bend plant a public address system has been installed, with an outlet to every room in the building, with additional stations on the outside of the plant.

At the turn of a switch—instantly—the voice of management can be made available to every worker in the plant. The system is so arranged that the speaker may be in New York or Chicago, and the voice transmitted by telephone. It is said to have cost \$25,000 to effect the arrangement.

The possibilities of such an experiment seem broad, not only for use in the event of labor trouble, but for bringing management in closer contact with every worker, at any time when such contact might be worth—much more than \$25,000.

—H. H.

**THIS MONTH'S  
PRODUCTION  
FEATURE:**



One of the two, single-spindle, Hutto grinding machines fitted with Hutto precision hones for finishing cylinder bores. Each bore is rough and finish-honed to produce the specified quality of surface finish

A big custom job representative of the work coming out of the GMC truck engine plant

July 4, 1936

*Automotive Industries*





Taking the final hurdles. End of final assembly line where the finished jobs are minutely inspected. Whatever minor repairs, adjustments, or paint touch-up may be needed, are made at this station

*Demands of quality and precise interchangeability dictate the production layout for*

By  
Joseph  
Geschelin

# GMC Truck Engines

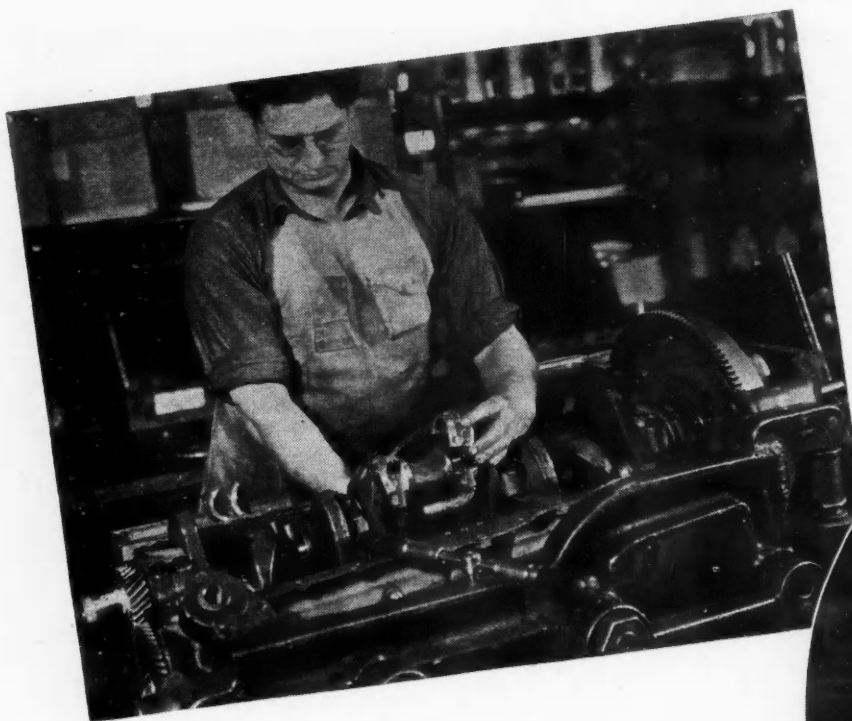
**C**OMMERCIAL transportation places almost incredible demands on heavy-duty transport vehicles—capacity loads, intensive operation, and the added loads due to low gear work. Yet in recent years the operators have insisted upon, and have been provided with, engines that will stand up under this gruelling service without a whimper, and indeed without requiring repairs or overhauling for great mileage periods.

It will amaze many of you to learn that in coach service, for example, the engine is expected to give a useful life of at least a million miles.

When considered from this point of view it is not surprising to find that heavy-duty engines are accorded heroic treatment in matters of design, selection of materials, and in manufacturing techniques. Materials, particularly, must be of such character as to provide great strength, an adequate factor of

safety, resistance to corrosion and the effects of repeated stress, and resistance to abrasion and wear.

For an intimate picture of an outstanding example of current practice in this specialized field we give you the operations of the General Motors Truck Corporation of Pontiac, Michigan. Earlier this year, the company introduced a complete line of motor trucks ranging in capacity from ½ ton upwards and embodying many



Left—View on small engine assembly line showing the fitting of connecting rod bearings

Below — Rough-turning small pistons on Sundstrand lathe



options in equipment and powerplant to fit specific operation conditions. We believe that everyone in the industry will be interested in the production methods employed, particularly so far as they relate to the line of engines

built completely within this plant.

Although G.M.T. boasts of the largest truck and coach assembly plant in this country, easily the most important

## Principal Engine Fits and Clearances

(Group 1 Engines)

	Tolerance	Finish	Clearance (In.)
Camshaft Bore { Journals	0.001 in.	Ground	
Bearings	0.001 in.	Reamed	
Connecting Rod Bearings { Upper	0.0002 in.	Diamond	0.0002 - 0.0005 loose bet. bore & pin
Lower	0.0003 in.	Reamed	0.00175-0.00225 bet. bearing & crank pin
Main Bearings—Interchangeable Precision type—wall thickness	0.00025 in.		
Crankcase Bearing Bore	0.001 in.	Reamed	0.002 bet. bearing and crankshaft
Cylinder Bore { Diameter	0.002 in.		
Taper	0.001 in.		
Out of round	0.001 in.		
Note: Bores graded in eight sizes in steps of 0.0003 in.			
Pistons Diameter	0.002 in.		
Note: Graded in eight sizes in steps of 0.0003 in.			
Piston Pin	0.0002 in.		
Piston Rings & Cylinder Wall			0.010-0.015 gap
Piston & Cylinder Wall (skirt)			
Mod. 239 & 257 { Top			0.0035 av.
Bottom			0.00275 av.
Mod. 226 { Top			0.00375 av.
Bottom			0.003 av.
Connecting rod weight (either end)	1/8 oz. (total)		
Crankshaft balance	3/4 oz. in. (total)		
Flywheel balance (static)	3/4 oz. in. (total)		

feature of its activity is the engine plant in which are produced all of the valve-in-head engines used in the intermediate and heavy duty vehicles of the line. As we study the design and manufacture of these engines we are impressed with the fact the valve-in-head principle results in rather heavy construction, and more expensive production procedures. In discussing this with Col. G. A. Green, v. p., in charge of engineering, we learn that the added burden of high production costs is accepted as a natural consequence of certain inherent operating advantages offered by this design.

Among the advantages claimed for the valve-in-head engine, Col. Green lists the following:

Accessibility for valve adjustments, permitting the arrangement of intake and exhaust manifolds and all accessories on one side of the engine.

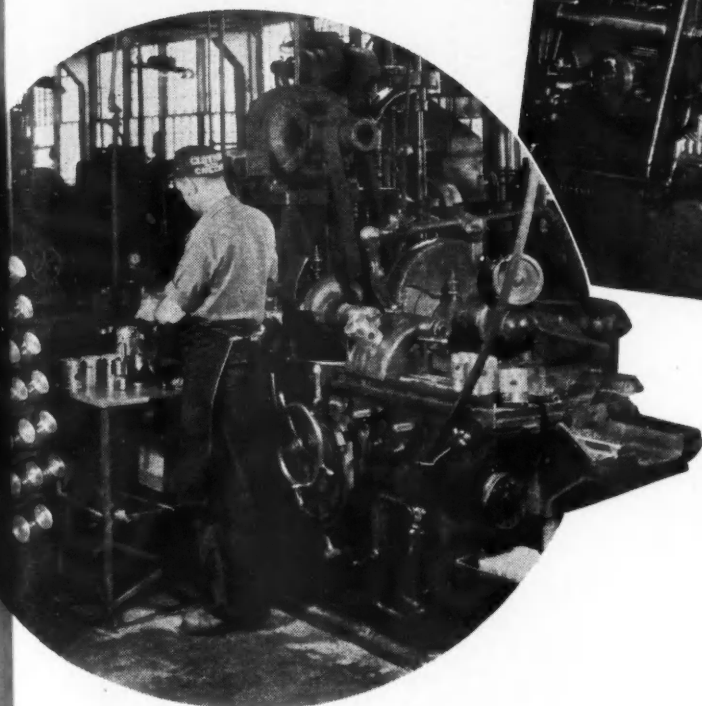
Simplified servicing and adjustment of valves and valve operating mechanism, since the entire head assembly may be removed and replaced with a reconditioned head.

Due to high thermal and volumetric



Right—Timing gears are cut in the small engine department on this battery of machines. They use two types of gear-cutting equipment—in the row at the left are Barber-Colman hobbbers; in the row at the right are Fellows gear shapers

Below—Landis grinder is used for rough and finish grinding of O.D. in separate settings



family similarity, all engines exhibit certain common design characteristics, the most important of which are—

valve seat inserts, necting rods, floating wrist pins, full pressure lubrication, close manufacturing tolerances.

To permit easy identification of the engine models in our discussion of the plant set-up, we are listing them as follows:

GROUP 1. Type 239, Type 257, Type 286.

efficiencies, the current production engines regularly attain 120 lb. B.M.E.P.

Better cooling is achieved and due to the relatively small amount of exposed combustion chamber area, heat losses are reduced to a minimum, resulting in better fuel economy.

Either wet or dry liner applications can be so designed that at no point will the flame impinge on the liner seal.

Since valve-in-head engines are inherently narrow they are particularly adaptable for rear crosswise coach installations.

It is interesting to note that the GMC line of truck engines consists of nine sizes made in three groups, with three models to a group. The engines in each group are interchangeable as to mounting dimensions, differing principally in displacement and power output. Much in the same fashion, the truck models are made in three groups so that a given group of engines can be mounted in any chassis of the same line, affording the wide choice of power plant options required for a variety of operating conditions.

Following out the general idea of

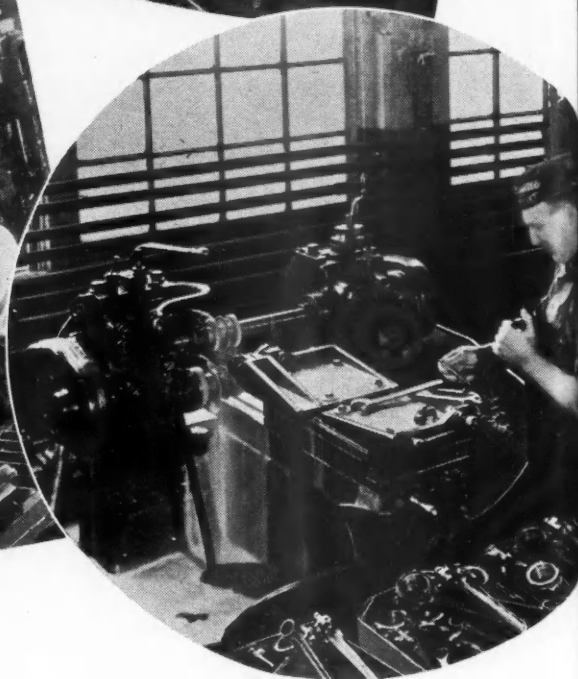
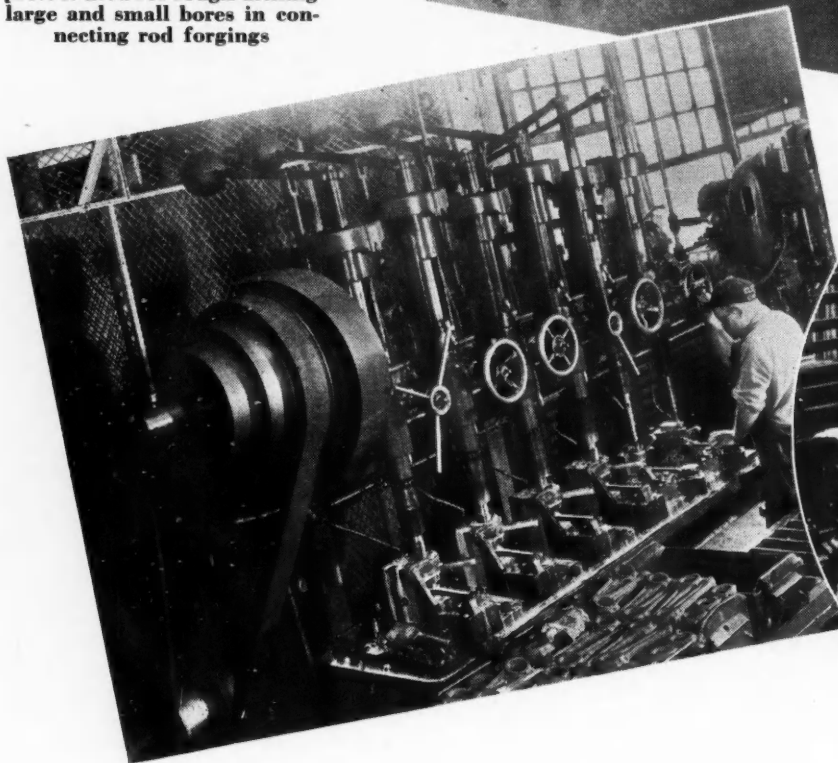
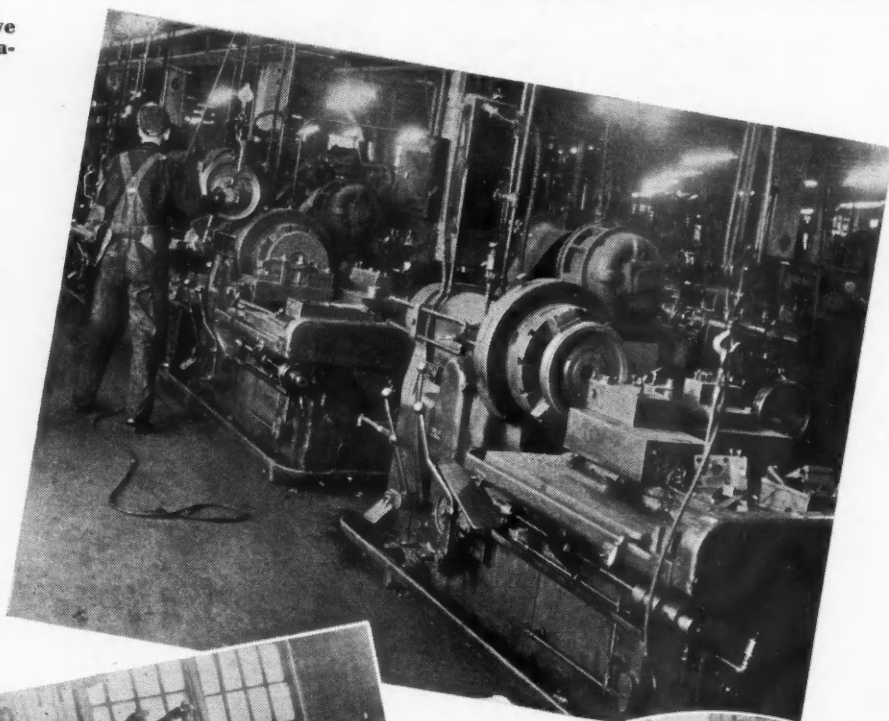
## Factory Routing Cylinder Block Sleeve (Custom Engine)

Operation	Type Machine
Normalize	
Rgh. bore ID (4) at a time	Moline Boring Mill
Rgh. turn OD	Potter & Johnston Lathe
Face (1) end	LeBlond Lathe
Face shoulder & turn pilot under shoulder	LeBlond Lathe
Semi fin. turn OD	LeBlond Lathe
Finish bore ID	Foot-Burt Boring Mill
Chamfer ID both ends & turning oper.	
Finish turn OD	LeBlond Lathe
Hydraulic test	1500 lbs. Pressure
Saw off driving lugs	Hand mill
Cut undercut, face both ends to length and chamfer and turn flange OD	
Mill driving lugs	LeBlond Lathe
Inspect	Hand mill
Heat treat	
Harden and draw and clean	
Inspect	
Rgh. grind centers	Engine Lathe—special set-up
Face inside of flange and neck 1/8 in. wide	LeBlond Lathe
R & F grind OD 5.2525-2.2515	Norton Grinder
Grind bore 4.989-4.991	Bryant Grinder
Grind face and flange dia.	Norton Grinder
Grind chamfer	Engine Lathe
Grind 5.246 dia.	Norton Grinder
Inspect	100%

**Right**—Gisholt Simplimatic lathes have been tooled up for the preliminary operations on the flywheel

**Circle**—Cincinnati automatic mill set up to mill bolt seats and saw off caps on connecting rods. A double-end indexing fixture is used to facilitate handling and to reduce idle time

**Below**—No. 4 Foote-Burt drill press is used for rough-drilling large and small bores in connecting rod forgings



**GROUP 2.** Type 331, Type 400, Type 450.

**GROUP 3.** Type 525, Type 616, Type 707.

Group 1 are fitted with valve seat inserts of a high chromium molybdenum steel, while Groups 2 and 3 use the Stellite-faced, screwed-in type of valve seat. Engines in Group 3 also are equipped with dry-type replaceable hardened cylinder liners.

#### General Scope of Operations

As intimated earlier, the plant facilities include two separate manufacturing

establishments—the engine plant, and the assembly plant.

The engine plant comprises the following departments:

- small engine shop
- large engine shop
- heat treat
- engine assembly line
- engine test
- inspection
- transmission department

The assembly plant comprises the following department:

- receiving inspection
- chassis assembly lines
- chassis special equipment

- dynamometer test
- truck cab assembly
- paint shop
- final uplift
- body mount
- final inspection and touch-up

In general, the engines of Groups 1 and 2 are built in a separate department using production equipment suitable for continuous straight line manufacturing. This large department is laid out with rows of similar type machines, a separate row for each engine. This department produces all parts required for the small engines

Left—Hall high-speed grinding heads are used for finishing the hard-surfaced valve inserts which are standard on all GMC truck engines. Relation of valve seat to center of guide bore is held within total indicator reading of 0.001 in.

Circle—Bore and face open end and center head end of piston on LeBlond lathe—in small engine department

Below—24-in. Bullard vertical lathe is used to finish the flywheel friction face surface

including pistons, flywheels, heads, crankcases, cylinder blocks, etc.

Group 3 engines for truck and bus applications are built in another department in more or less custom-style using standard machines of universal character more suitable for job lots. This department, necessarily, is manned by skilled mechanics who are capable of taking a major part such as the crankcase, for example, and performing a number of successive operations on several different machines.

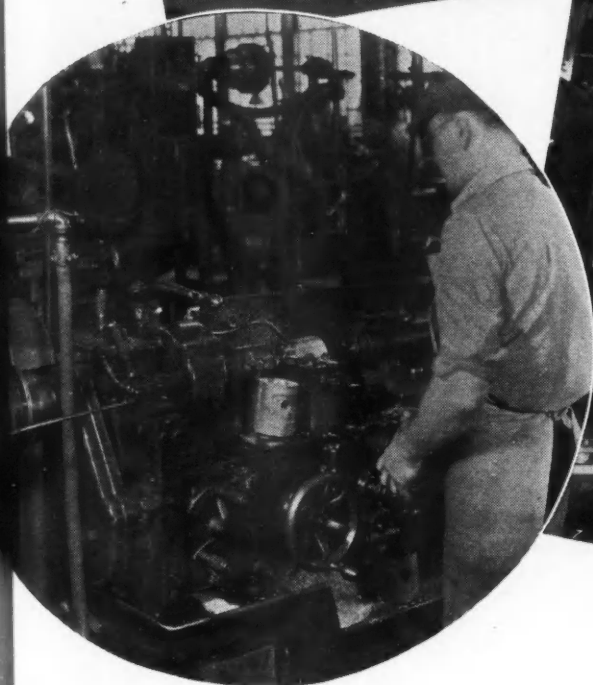
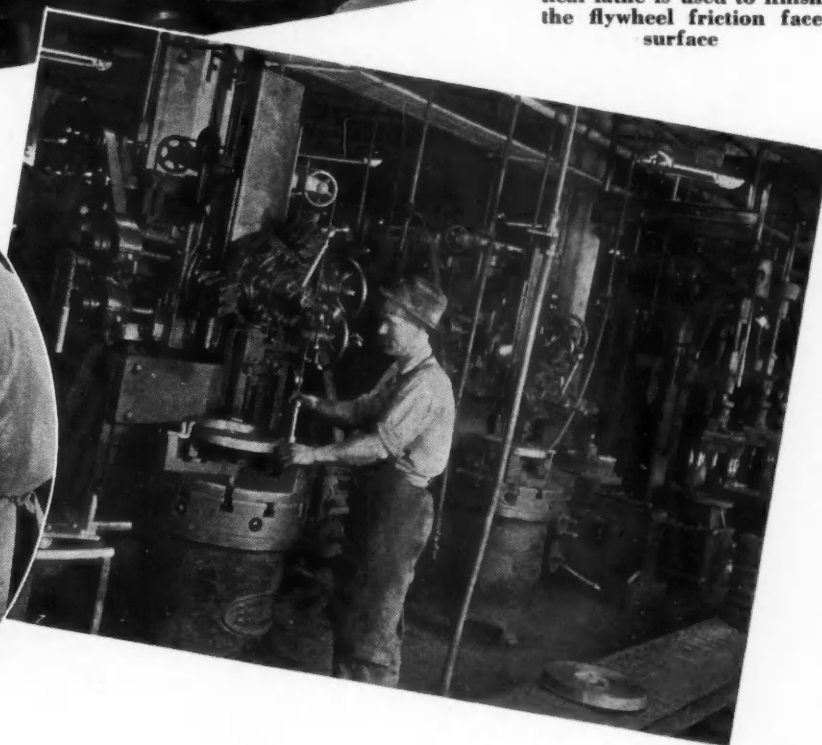
This marks a radical departure from the usual practice in mass production

plants and it may be likened to the craftsmanship in a machine tool plant or in the tool room of a large manufacturing plant. On the other hand, the small-engine department has straight-line procedure with fixed tooling set-ups so that the operators in its territory are more like those found in mass production shops where the skill of the man is confined to his ability to handle just a given standard set-up.

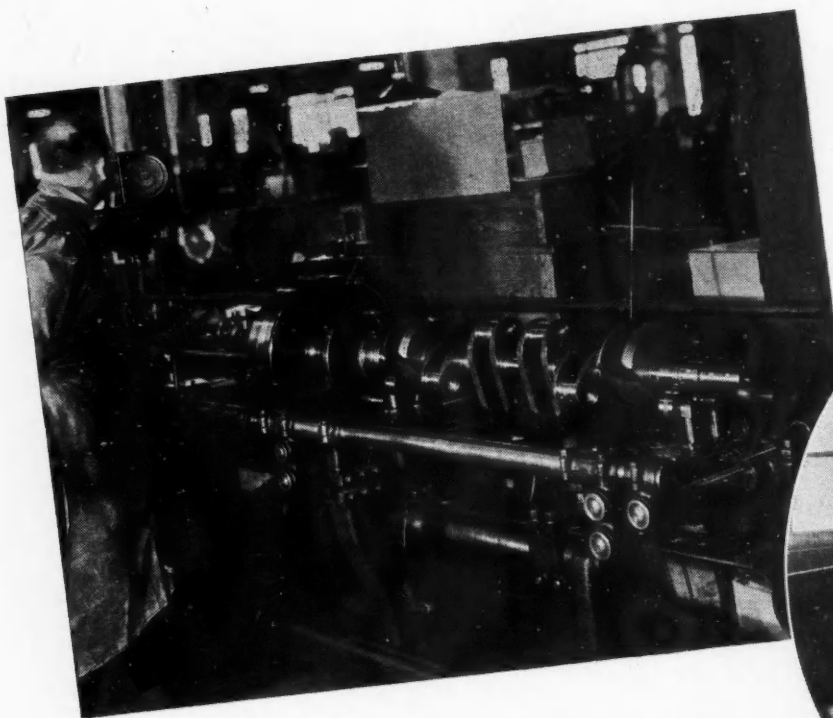
Since we expect to devote the major part of this study to the operations in the engine plant, the work of the assembly plant will be covered principally by some representative photographs taken at strategic points.

However, it is of interest to touch on a few of the high spots in that gigantic department. As listed above, it has complete facilities for chassis assembly, body fabrication, and body paint. It has three major assembly lines on the second floor fed from unit-assembly departments located on the floor below. These assembly stations, in general, are located directly under the point of usage on the final assembly line, the units being hoisted up to the line through openings in the floor.

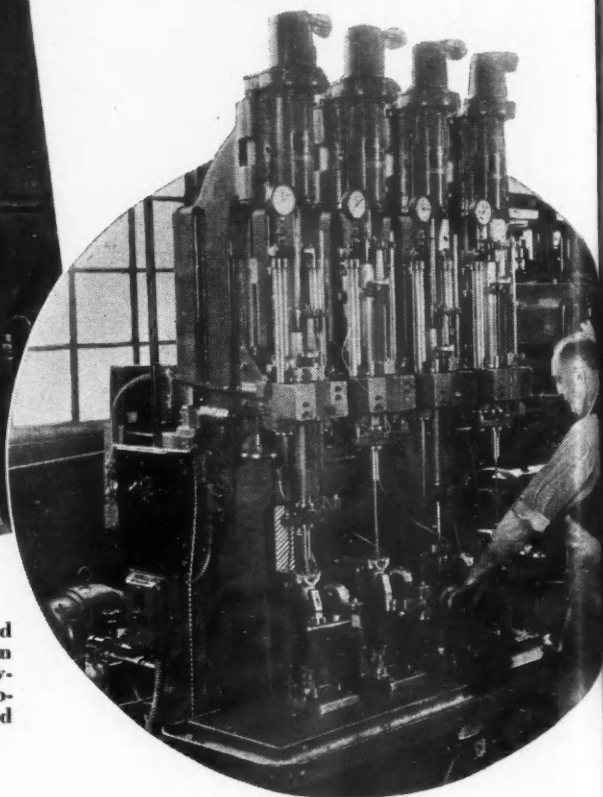
Rear axles are sub-assembled complete with brake drums, brake shoes,







Left — Crankshafts are balanced statically and dynamically on a large Gisholt balancer and held to  $\frac{3}{4}$  oz. in.



Right—Connecting rod oil gallery is drilled on this four-spindle Avey-matic fitted with automatic hydraulic feed with electric control

and other essential parts before delivery to the assembly line directly overhead. Similarly clutch and transmission are assembled to the engine before delivery to the line. All unit assembly stations are provided with sub-assembly stations at the side and obtain parts for assembly from conveyor lines and storage banks.

For 1936, GMC introduced a new line of smartly tailored trucks with modern cabs of standard and deluxe construction depending upon the desires

of the operator. However, all cabs are of steel construction featuring the new "helmet top." These cabs are completely fabricated in the assembly plant using framing bucks for alignment and arcs and spot-welding techniques for making the various joints. Bodies are cleaned and prepared for painting according to customer's specifications. The final finish is Du Pont Dulux synthetic resin enamel which is baked on in an oven for 75 minutes over a prime coat.

After assembly and preliminary line inspection, chassis are routed to the truck dynamometer test where they are run on chassis rolls for twenty minutes. Leaving the dynamometer test, the chassis come down the long ramp to the body and cab mount line on the main floor. Chassis and cabs are carefully scheduled so that they meet at the first station of this line. At the end of the final assembly line, each vehicle is carefully inspected and receives minor repairs, adjustments, and touch-up of finish where necessary.

#### General Engine Plant High Spots

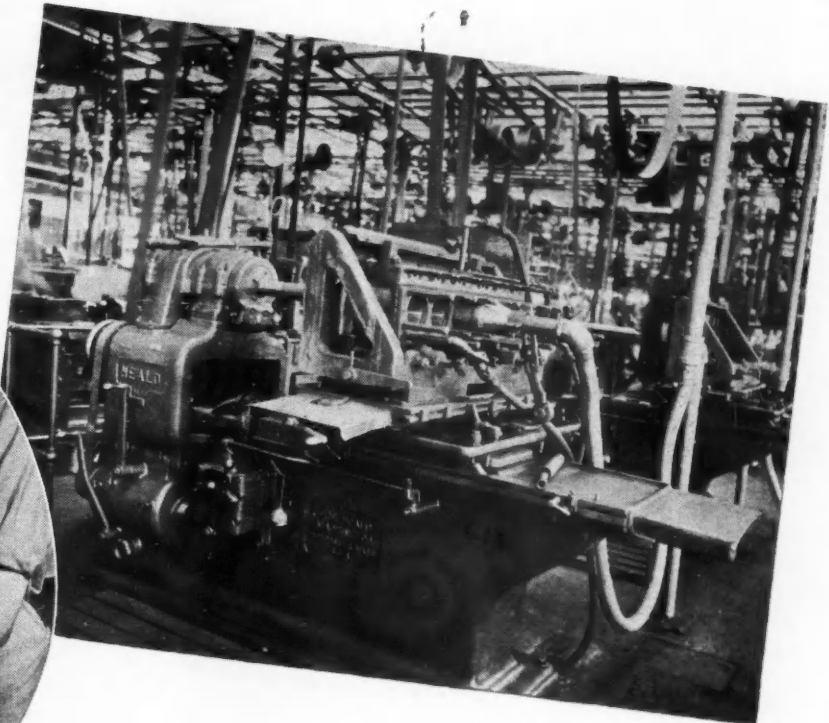
Before proceeding to the details of engine production it would be of interest to consider a few of the high spots in this plant. There is first, the need

### Factory Routing Cylinder Block Sleeve and Stud

(Custom Engine)

Operation	Type Machine
Chip sand blast	
Spray sealer	
Drill 5 holes	Cincinnati Radial Drill
R & F mill top valve cover plate surface	Ingersoll Mill
Mill bottom & heater outlet pads (rough & fin. mill 4 sides)	Cincinnati Mill
Mill water outlet pad	Cincinnati Mill
Drill & ream 23 holes	American Belt Drill Press
Rgh. bore (6) cyl. to 5.126-5.140, semi fin. bore cyl. to 5.225-5.235	Moline Hole Hog Mach.
C'bore & chamfer top of cyl. block fin. bore cyl.	Baker Mach.
Drill, C'sink & tap 21 holes	Cincinnati Drill
Core Drill (12) valve lifter guides holes	
drill (6) holes, C'sink tap (6) angular holes, drill & ream (4) oil tube holes, C'sink & tap all cyl. head stud holes Heat block & assembly sleeve	Defiance Drill Press Hammond Drill Press
Rgh. & fin. grind bores & water test	Heald Grinder No. 50
Inspect	100%

Right—After the cylinder liners are pressed into the large blocks they are rough and finish bored to precise limits on this No. 50 Heald internal grinder



Left—A special ring compressor fitting is used at assembly to prevent ring breakage in fitting piston and rod assemblies



for close manufacturing tolerances and precise clearances between mating parts. This is of greatest importance on heavy duty equipment where parts are highly stressed and where an accurate film of lubrication is essential. Not only is this desired in the original set-up of the engine but precise interchangeability of parts must be maintained to assure the same order of fits when parts are serviced.

Table 1, prepared by the GMC truck engineering department for this article gives the fits and clearances for a number of important bearings in Group 1 engines. No selective fit is made in the case of camshaft bearings as these are bored and reamed after assembly in the case. Cylinder bores are held within 0.002 in. of standard size and are graded into eight sizes in steps of 0.0003 in. Pistons are graded in similar fashion to match cylinder bores of the same grade.

To assure adequate metal for cylinder refinishing or reboring and to promote more uniform cooling, as well, cylinder wall thickness is held within

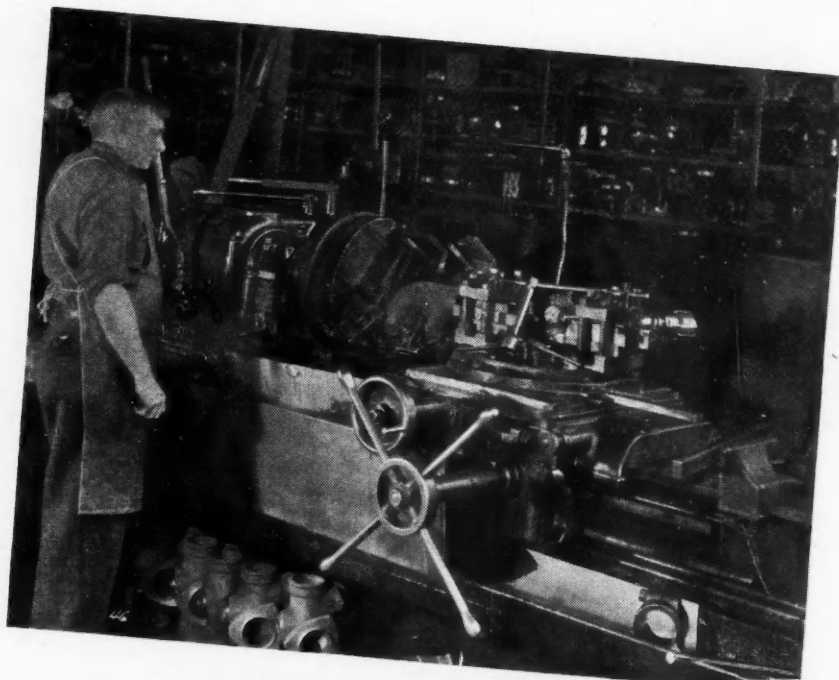
## Factory Routing Cylinder Block and Studs

(Small Engine)

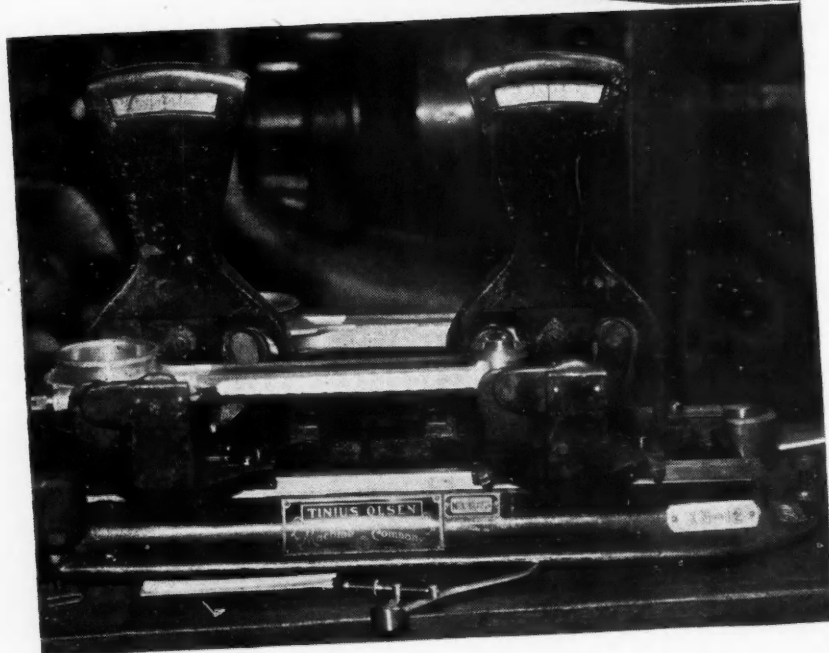
Operation	Type Machine
Paint	Special Duco-Sealer
Rgh. Mill top	Planer type Ingersoll Mill 10 blocks at one travel
Drill 38 holes in top, bottom cover side and ends	Greenlee Drill
Ream two locating holes	Cincinnati Drill Press
Ream 1 clean hole in cover side	Cincinnati Drill Press
Mill water pump pad	Ingersoll Mill
Rgh. & fin. ream 3 cleanout holes	Foot-Burt Special Head
Drill 14 holes in top	6 Spindle Foot-Burt Boring Machine
Rgh. bore cyl. bores & assem. 5 cleaning plugs	Cincinnati Single Spindle
Drill Oil return hole	Ingersoll Mill & Elec. Drill
Fin. mill top & bottom & C'sink all small holes	6 Spindle Boring Mill
Semi finish ream hole	H-D Single Spindle Defiance Drill Press
Bore, ream & face flange in water pump	24 in. Cincinnati Drill Press Ex-Cell-O Head
Opening, drill C'sink & Tap 5 holes in front end	Cincinnati Drill Press
Drill C'sink & tap valve rocker arm oil inlet hole	Cincinnati Drill Press
Fin. ream cylinder bores	6 Spindle Foot-Burt Boring Mill
Chamfer bottom of bores	Hutto Lap Machine Carborundum 7-C
Rough lap six bores	Hutto Grinding Mach. Carborundum No. 400
Finish lap six bores	Colburn Heavy Duty Drill Press
Bore compressor chamber	6 Spindle Foot-Burt Boring Mach.
Chamfer cyl. bores burr	Greenlee 4 Way Tap Mach.
Tap 22 holes	
Drive 4 push rod cover studs & four water pump studs	
Water Test	Water test fixture
Inspect	Inspection 100%

NOTE: Use magnetic thickness gauge for wall thickness 8 oper. to 1 bore 48 to 1 block





**Left—**Rough and finish operations on the exhaust manifold flange are completed in one setting on this Acme lathe



**Above—**Con rods for large engines are finished to exact weight. Each rod is weighed against a master rod on this double-end Olsen scale and milled along the web and bearing cap until exact balance is attained

definite limits and is checked 100 per cent by means of a magnetic thickness gage. Eight separate readings are taken on each bore with this gage, making a total of 48 readings per block. Variations in wall thickness beyond the prescribed limits justify scrapping an entire finished block.

On engines of Groups 1 and 2, pistons and connecting rods are selected in matched sets of equal weight for the same engine. Connecting rods are so selected that the weight of either end does not vary more than  $\frac{1}{8}$  oz. from the master rod. Group 3 rods, on the other hand, are matched after machining against a master rod and

**Right —** Combustion chamber in cylinder heads is formed in one setting on this six-spindle Moline Hole Hog

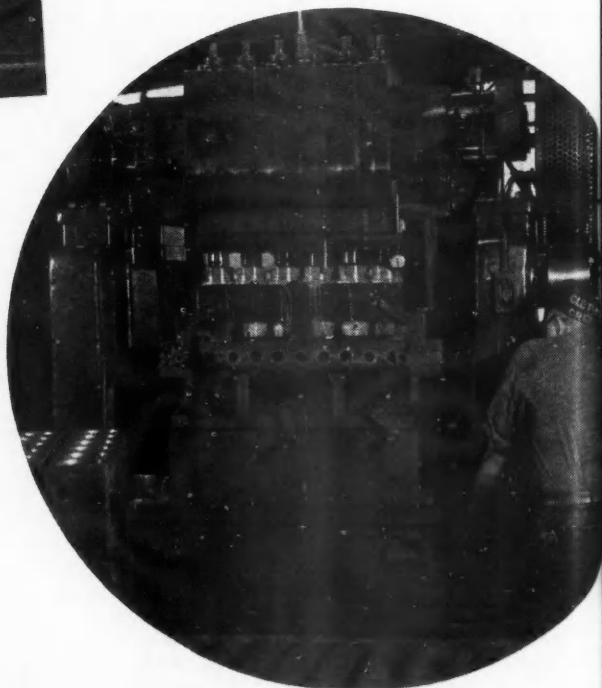
then milled at both ends so that they are all of equal weight and absolutely interchangeable.

These few cases are cited to show the need for special care in machining and to emphasize the practice in this plant, of 100 per cent inspection on all parts. While such procedure would be impractical in passenger car production, it is an essential element in the building of a long lived heavy-duty engine.

Among the 100 per cent inspections to be found here, we have the hardness test for liners, cylinder heads and blocks, inspection of valve seat insert alignment, water testing of blocks and heads; and size of pistons, cylinder liners, large engine manifolds, etc.

A variety of cutting tool materials are used in the engine plant depending entirely upon material to be cut, the nature of the set-up, as well as the operating conditions. Apart from the standard tools, they use cemented-carbides and the diamond, the specific application of each tool being determined by an experimental set-up prior to adoption for production.

Recently the factory management started on a preliminary program of modernization, the first fruits of which are to be found in several new ma-



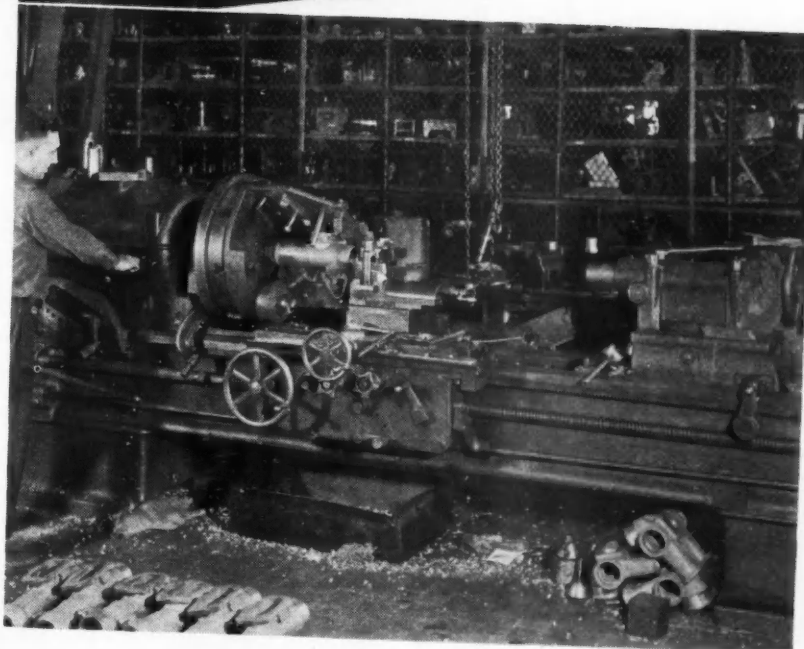


**Right**—This huge Cincinnati internal grinder set-up is used for finishing the liner surface of the big brake drums. Work is held by means of a large electro-magnetic chuck powered by an individual motor

chines installed in the small engine department. The most interesting of these is the new Aveymatic drilling machine for rifle-drilling the connecting rod oil gallery. This machine has a hydraulic feed mechanism, electrically controlled for achieving a special step-by-step feed which serves to prevent drill breakage and facilitate the production of good straight holes. You will recall that this machine was first shown at the National Machine Tool Exposition in 1935.

Other new items include a Moline Hole Hog for drilling crankcase oil holes which was given a little art treatment to conform to the new mode in machine tool eye-appeal, a Foote-Burt boring machine, and a new set-up of Hall eccentric valve grinders for the precision grinding of the valve seat inserts.

A rather novel situation is found in the gear cutting section in the small engine department and in the transmission department. They use two makes of machines in each department, arranged in two rows. Thus in each department you find a row of Barber-Colman hobbing machines and a paral-



**Above**—This massive 30-in. Lodge & Shipley lathe is required to handle the rough and finish bore, ream, and chamfer on the exhaust manifold center section which presents a difficult machining problem

**Left** — An Ingersoll mill is used for rough-milling the bottom face of large aluminum crankcases



lel row of Fellows gear shapers. Generally, the size of the gear blank determines the type of machine to which it may be routed. Incidentally, the gear department in the small engine plant handles the tooth cutting on all metallic and plastic-molded timing gears.

One of the operations that the factory is particularly proud of, is the double honing of cylinder bores. This is done with Hutto hones on single spindle Hutto machines.

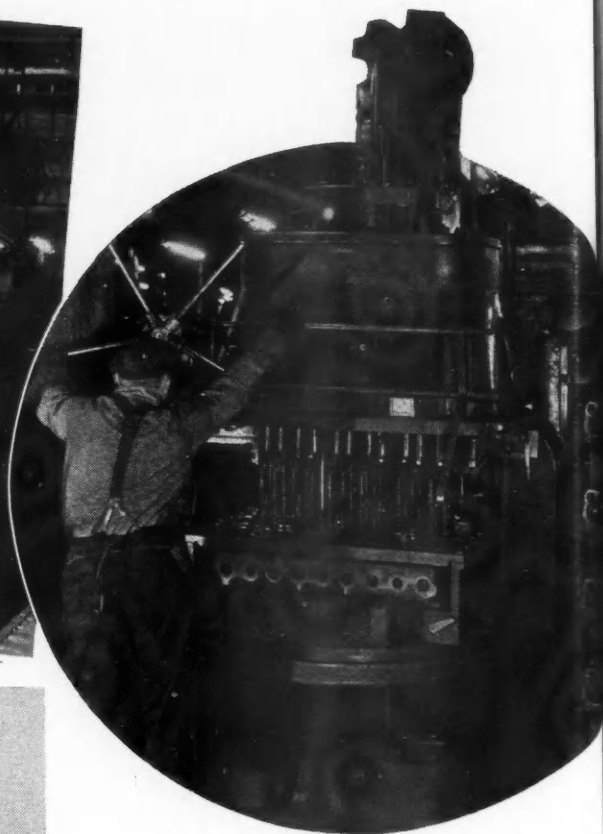
After the engines have been assembled and inspected they undergo a 100 per cent run under power. Engines in Groups 1 and 2 are run in on their



## Factory Routing Cylinder Head Valves and Stud

(Small Engine)

Operation	Type Machine
Spray sealer	Spray special Duco Sealer
Rgh. & fin. mill top & both sides, Rgh. & semi finish mill bottom	Ingersoll Mill Planer Type
Fin. mill bottom	Ingersoll Mill Planer Type
Brinell test and mark	Rockwell Test Mach.
Drill 24 holes in bottom	36 Spindle—Nateco Drill Press
Ream two locating holes	24 in. Cincinnati Drill Special Head
Drill 24 holes in top	36 Spindle—Nateco Drill Press
Drill valve guide hole and push rod tube holes	Nateco Drill Press
Tap and C'sink 17 holes	Hammond Hand Tapping
C'sink 24 holes	Cincinnati 3 Spindle Press
Form combustion chamber	Moline Hole Hog 6 Spindles
Mill flat in combustion chamber	Special Profile Mach.
Mill water outlet pad	No. 2 Cincinnati Mill Mach.
Bore valve stem guide holes	12 Spindle Foote-Burt Drill Press
Semi & finish ream valve stem guide holes	24 Spindle Foote-Burt Drill Press
Rgh. bore valve throats	Western Radial Drill Press
Drill & ream cleaning holes & drive in plug, ream 3 port holes, drill & C'sink & tap two holes in end for water outlet	21 in. Cincinnati Drill Press
Drill one hole in port side	6 Spindle Defiance Drill Press
C'sink & tap 10 manifold stud holes	Kokomo Hi-Speed Drill Press
Drill, ream, C'bore & tap thermometer hole	Wash tank
Drill & S'face spark plug holes	Fixture Bench
C'bore, ream & tap spark plug holes	
Blowout and wash	
Water test	
Assemble valve stem guides & drive down 12 guides	
Semi finish ream valve stem guides, fin.	
C'bore intake valve throats	24 Spindle Foote-Burt Press
Fin. ream valve stem guide holes	12 Spindle Foote-Burt Press
Bore Int. & Exh. valve throats, fin.	Single Spindle Aurora
C'bore for insert	Single Spindle Aurora
Assem. & drive in valve seats	
Grind ex. valve seat	Hall Grinder Special
Machine seat intake valves	Aurora Drill Press
Hand seat intake valve seats	
Grind in valves & stamp	
Drive in valve rocker arm studs, cover studs & push rod cover studs	12 Spindle Special Acme Valve Grinder
Water test	
Drive (6) rocker arm brkt. studs	Bench Water Test Fixture
Inspect	Hi-Cycle Stud Driver
	100%



Circle—A 36-spindle Nateco is used for drilling 24 miscellaneous holes in bottom surface of the cylinder head

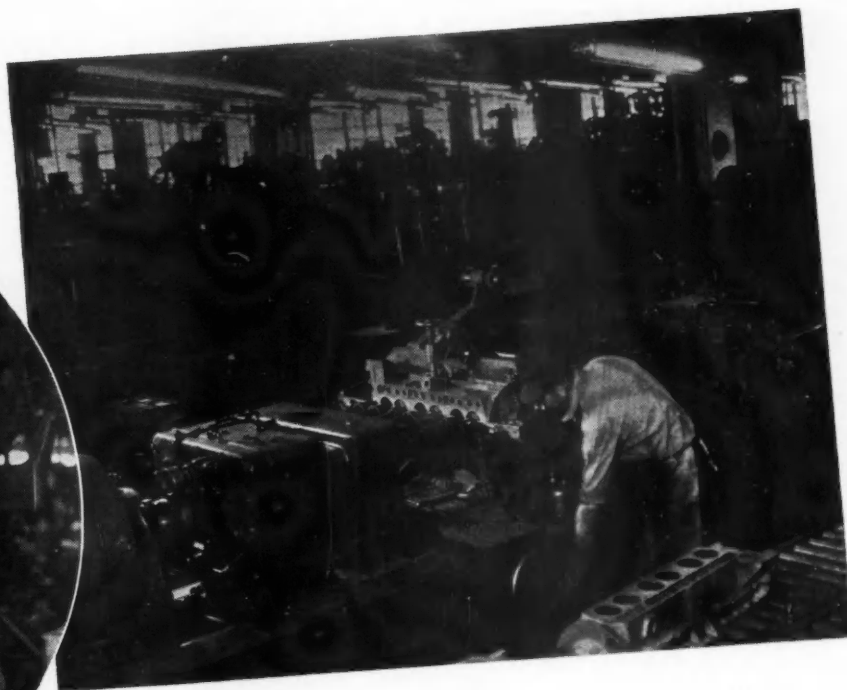
Above, left — Rough mill top and bottom surfaces of crankcases for small engines. This is a close-up of one of the big Ingersoll mills to show the procedure. As you will observe, one bank of cases is set to mill the bottom surface, the other for the top. Then the position of the cases is reversed in the fixtures to complete the job

own power on test stands for three hours. Coach type engines of Group 3 are run for ten hours—seven hours to break in and then three hours under full load on the dynamometer. After this test, the main bearings and connecting rod caps, oil lines and other important parts are removed for a thorough inspection, and then reassembled.

To further protect the engines on block test, the crankcase oil is circulated through an outside system which includes a centrifugal clarifier. This is pumped directly to the main oil line of the engine and is constantly returned to the filter so that the circulating supply is always clean and free of any materials which might scratch the bearings or clog oil supply leads.

**Right — Boring cylinder bores in crankcase section on heavy duty Le-Blond boring mill**

**Below — Six-spindle Moline Hole Hog used for rough boring cylinder bores**



Foot-Burt machine, semi-finish-reamed, finish-reamed, and then honed and lapped in two settings on two, single-spindle, Hutto machines. At final in-

spection, cylinder bores are graded according to standard size in steps of 0.0003 in. In addition, as explained earlier, wall thickness is checked at 48 points by means of a magnetic thickness gage.

## Engine Production

The equipment in the engine plant has been in use for some years and may be described as of conventional type generally accepted for moderate production volume. As mentioned earlier, Groups 1 and 2 engines are built in a separate department with a straight line layout, separate rows of similar machines being employed for the different models. Fixtures and tooling in this department are designed for long time set-ups so that fairly high volume may be handled most economically with average grade machine tenders.

While the pictorial section of this article provides a vivid picture of many activities in various departments, we intend to give the complete details of certain major operations by listing factory routings. In some cases the routings will be supplemented by explanatory comment.

Three major castings are processed in the small engine plant—the cylinder block, cylinder head, and crankcase. In each case, the first milling operations are handled on planer type Ingersoll mills, handling ten blocks at a time. All blocks and heads are checked for Brinell hardness within limits of 207-241.

Cylinder bores are rough-bored on a

## Factory Routing Cylinder Head Valves and Stud

(Custom Engine)

Operation	Type Machine
Normalize	Duco Sealer Spray
Spray sealer	Cincinnati Radial Drill Press
Drill (3) holes for clamping	Hand operation Portable grinder
Grind comb. chamber for loc. on mill	Ingersoll Mill
R & F mill tap bottom & mani. pad	Muller Radial Drill
C'bore, tap, drill, etc., 24 holes	Hammond Drill
Ream (2) loc. holes	Natco Drill Special Head
Drill 42 holes	Hammond Drill Press
Drill, tap, c'sink, etc., 30 holes	6 Spindle Natco Drill Mach.
Chip fin. & pull core wires	
Drill rgh. semi & fin. ream valve stem guide holes, bore clearance in comb. chamfer	Natco Drill Press
rgh. bore throats for (3) intake valve seats & rgh. bore for (3) exh. inserts	Cincinnati Drill Press
S'face & chamfer top of (6) valve stem guide holes, C'bore Hubbard plug holes	Barnes Drill Press
Drive valve stem guides	Air Hammer
Ream valve stem guides	6 Spindle Natco Drill
Broach & burnish valve stem guides	American Belt Power Broach
Mill push rod clearance	Barnes Drill Press
Semi & fin. chamfer thd. face top cham.	Cincinnati Drill Press
R & F tap thds. for screwed in valve inserts	Cincinnati Drill Press
Expand and blowout head, contract assy. & drive (3) exh. valve seats	Ingersoll Rand Air Motor
Grind comb. chamber to gage	Hall Grinder Special Set-Up
Grind valve seats	
Assem. & drive (14) stud & (1) pipe plug	
Water test	
Assem. valves to head with springs	



In the production of connecting rods, certain models are provided with babbit bearings which are spun in on M.C.E. spinning machines. The most important part of the procedure is accurate control of temperature of the tin and babbit baths. This is achieved through thermostats, automatically controlled by a Leeds-Northrup control panel. The babbit bath is held around 790 deg. F., while the tin is held at 700 deg. F. At regular intervals the metallurgical department checks the baths and tests the strength of the bond in the rod.

special two-position indexing fixture for spotting angular locations.

The flywheel ring gear is shrunk-on and the flywheel assembly is statically balanced after machining, on a special G.M.C. balancing machine designed to permit drilling for balance while the work is in the fixture.

Cylinder head operations are conventional in character as will be evident from the factory routing shown here. The heads for Group 1 engines are fitted with special alloy steel valve seat inserts while those for Groups 2 and 3 have screwed-in Stellite-faced inserts.

utilizing conventional type machines.

When we get to the big engine department we find an entirely different order of production technique more consistent with a custom built job. The equipment is more on the order of tool room machinery and the operators are skilled all around mechanics.

Nevertheless, the big engines involve some particularly difficult manufacturing problems, not the least of which are concerned with the fabrication of the exhaust manifold center section and the dry liner. The exhaust manifold center section presents a tough metallur-



Left—Two-way Barnes rifle drilling machine is used for the crankcase oil gallery on small engine cases

Below — Finish reaming cylinder bores on a six-spindle Foote-Burt machine

All rods are rifle-drilled for full-pressure lubrication and on rods for the small engines, rifle-drilling is done on the new four-spindle Aveymatic machine with hydro-electric feed control. Both ends of the rod are diamond-bored on a Special G.M.C. machine fitted with Ex-Cell-O spindles. After machining, the rods are weighed and stamped and then sorted into banks of equal weight.

Although crankcase machining is conventional several operations are worthy of special mention. One is the drilling of the long oil gallery on a two-head Barnes horizontal rifle-drilling machine. The cycle is so timed that both drills enter simultaneously, meet just short of the center and pause, then one drill backs away while the other continues through to complete the hole. The other operation is that of drilling eight angular oil holes on a new Moline Hole-Hog which is equipped with a

In all cases the insert rings are contracted by exposure in a Dry-Ice cabinet and the assembly further aided by heating the head in a hot water tank. After the inserts have been pressed in they are ground to precise limits for seating the valves. This operation is performed on a machine fitted with special Hall high speed grinding heads, the concentricity of the seat being held and checked within 0.001 total reading with respect to the valve stem hole.

Pistons for all engines are of aluminum alloy, heat treated. As shown on the routing for the small engine, the piston line is compact and very simple,



gical problem inasmuch as the part is subject to great extremes of temperature, i.e., rapid changes from maximum to minimum, producing unusual

changes in dimensions combined with stress reversal.

The metallurgical solution consists in finding the kind of alloy that will have the greatest resistance to burning; also the alloy must resist the high stresses set up by the rapid changes in temperature. Naturally, the most serious complication lies in the fact that

but the specification was changed recently to a Ni-Resist alloy without copper; and they are also doing some further testing of the 18-8 and high chromium heat resistant alloys.

Machining this manifold is always a tough job. The routing shown below gives the details of the few simple set-ups on heavy duty machines. The first step is to anneal the casting. The two port holes are milled on a vertical Ingersoll mill and then are counterbored on an American drill press. Succeeding steps are:

—rough and finish bore, ream and

an electric furnace iron casting having the following composition:

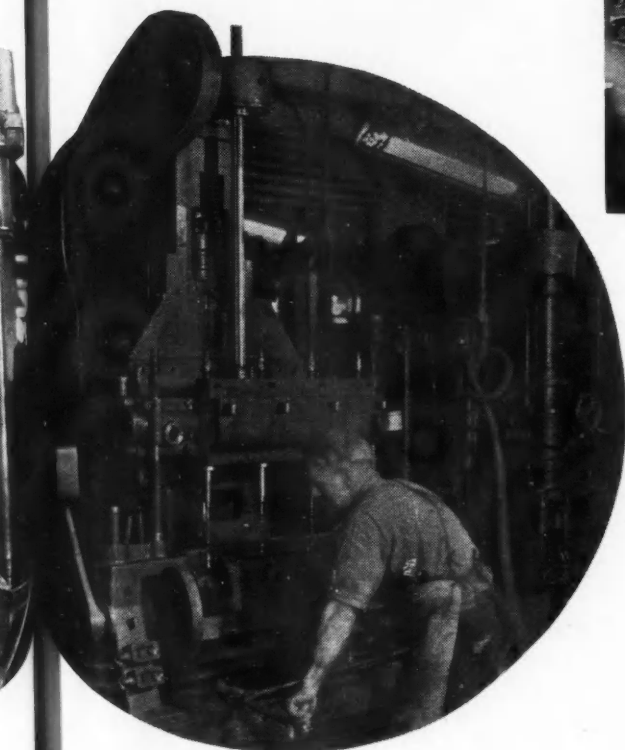
Total carbon	.....3.10 to 3.40 per cent
Combined carbon	.. .75 to .90 per cent
Manganese	..... .55 to .75 per cent
Phosphorus	..... .20 max.
Sulphur	..... .10 max.
Silicon	.....1.90 to 2.10
Chromium	..... .55 to .75
Nickel	.....1.80 to 2.20

This liner is normalized by heating

**Right**—Rough and semi-finish boring main and cam bearings for large crankcase on this Rockford boring mill. Indexing table is designed to hold two blocks at a time to improve productivity by utilizing cutting cycle for loading another block



**Below**—Eight angular oil leads are drilled in crankcase on this special four-spindle Moline Hole Hog. The fixture is of indexing type which permits angular setting of the work.



chamfer both ends in separate set-ups on a 30 in. Lodge & Shipley lathe

—rough and finish bore, ream and chamfer pilot flange and exhaust flange on an Acme lathe

—rough and finish turn and face of heater outer end pad on an Acme lathe

—drill, countersink, and tap holes in pads and exhaust flange in separate set-ups on American Radial drill press. Machining operations are followed by a first inspection, then the

studs are driven in and followed by another 100 per cent inspection.

Another interesting job is the machining of the cylinder liner. This is

to 975 deg. F. in preparation for machining, and after preliminary machining operations, it is heat treated in a furnace held at 1550 to 1575 deg. F. for 30 minutes and quenched in still oil. Quenching is done by mounting the sleeve on a special close-fitting arbor of segmented form which prevents a change in dimensions. After heat treatment, the sleeve has a hardness of around 512 Brinell or Rc. 48 to 52. As shown in the routing, after heat treatment, the liners proceed to the various grinding operations.

It is interesting to note that only the O.D. is rough and finish ground, the inside diameter being rough ground only. The reason for this is obvious since the sleeve has to be pressed into the cylinder bore which probably will cause some distortion of liner bore. After assembly in the block, the liner diameter is rough and finish ground on a Heald internal grinder.

the alloy selected for its metallurgical properties must also have reasonably good machining qualities. For some time they have used Ni-Resist castings



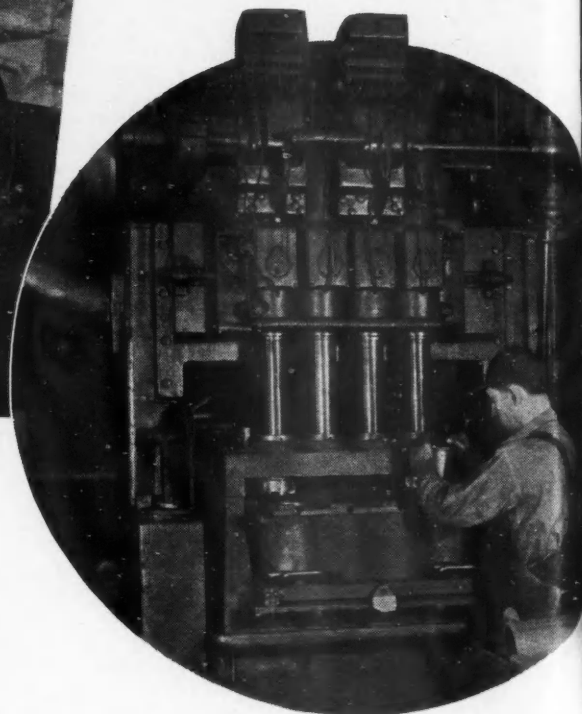
Left—Rough turn cylinder liner O.D. on Potter & Johnston lathe

It might be noted, too, that after the preliminary turning operations and prior to heat treat each liner is water tested at a pressure of 1500 lb. sq. in. applied by a compressor. This shows up the most minute surface defect which might otherwise slip through.

Complete routings are given on the machining of the cylinder head, aluminum crankcase, and cylinder blocks for the large engines. In the final steps on the cylinder block, the block is heated in a hot water bath and the liners pressed in. Then the bores are rough and finish ground on a No. 50 Heald Internal grinder, after which the block is water-tested with 90 lb. pressure.

On the large crankcases the cam and crank bores are finished with ce-

Right—Cylinder liners are finish-bored on this four-spindle Foote-Burt, being held in the special four cylinder fixture shown on the table



mented-carbide boring bars, holding to size within 0.0002 in.

Connecting rods for the custom-built engines are balanced to exact weight so that every rod is interchangeable. This is accomplished with a very simple set-up using an Olsen double-end scale in which the production rod is matched against a master rod. This station is

provided with a hand miller so that the operator may readily remove stock successively from each end until exact weight and balance are achieved.

Engine assembly for all models is a progressive line operation using standard cradles which carry the engines through successive stages of completion. Finished units required for assembly are located on each side of the line at points of usage. After final assembly stages are completed the engines are routed to the block test which is a 100 per cent test for all engines.

## Factory Routing Flywheel and Ring Gear

(Small Engine)

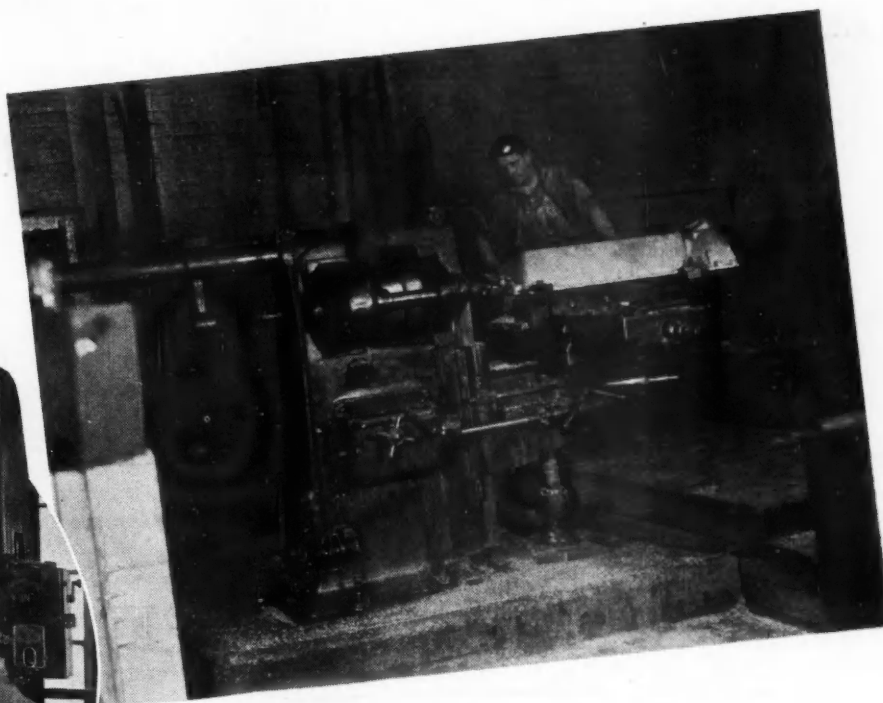
Operation	Type Machine
R. turn OD & face clutch side & bore	Gisholt Simplimatic
R. turn ring dia. R. bore 12 1/4 in. dia.	Gisholt Simplimatic
R. face rim ring gear seat & C'shaft face	Gisholt Simplimatic
Shrink on ring gear	Hydraulic Press 600 lbs. pressure
Ream pilot hole	Aurora Drill Press No. 24
Fin. turn OD & form radius fin. bore	Gisholt Simplimatic
Drill C'bore, ream 18 holes	24 in. Cincinnati Mul. Head 6 spindles
Fin. face friction face	24 in. Bullard Boring Mach.
Stamp timing marks	
Fin. face for crankshaft register	24 in. Bullard Boring Mach.
Tap (6) holes	Garvin Drill Press
Balance	G.M. Special Mach.

## Summary

The foregoing is a rather sketchy picture of the manufacturing facilities of one of the largest truck manufacturers in this country. It is representative of many important plants in the automotive field which have manufacturing problems quite distinct from those faced by passenger car builders and others whose volume runs into



Right—Milling two generator pads on large aluminum crankcases on this Cincinnati mill



Left—This four-way Greenlee is used for tapping 22 holes in the cylinder block



great quantities. By the same token the production equipment in this plant and in plants of similar character is of an entirely different order than is to be found in mass production.

The GMC truck plant is an excellent example of an operation where volume is relatively low compared with passenger car production, production costs high, and where the demands of quality and precise interchangeability require much hand labor, 100 per cent inspection operations, and the employment of operators possessing more than usual skill.

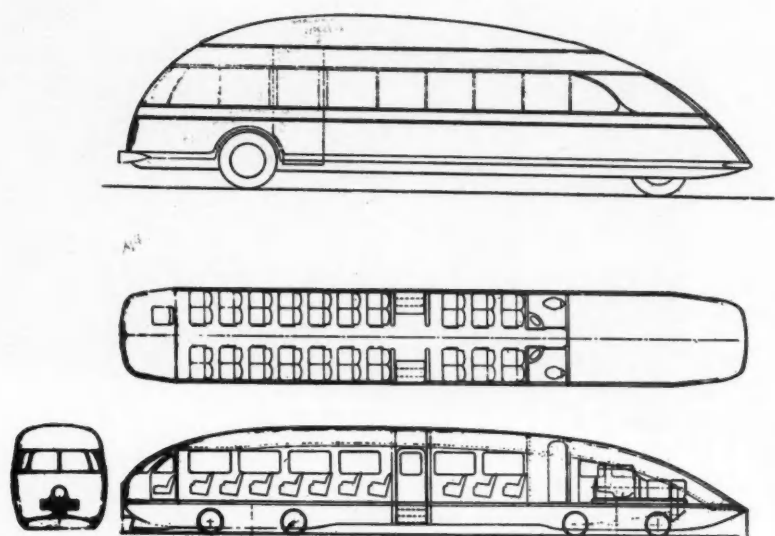
Equipment, naturally, is of conventional character, particularly in the custom engine shop. However, the few examples of new machines recently installed in the small engine shop indicate the possibility of applying modern equipment to facilitate productivity, reduce manufacturing costs, and yet accomplish these important objectives without any sacrifice in the high standards of quality that distinguish this operation.

## Factory Routing Connecting Rod

(Small Engine)

Operation	Type Machine
Machine	Coin Press Drop Hammer
Coin	
Straighten	
Rgh. Drill both ends	Footo-Burt No. 4 Drill Press 5 Spindle
Rgh. Ream small end and chamfer both ends	Cincinnati 21 in. Drill 2 Spindle
Broach small end	No. 2 LaPointe—Broach
Mill bolt seats and saw off caps	Cincinnati Automatic Mill
Disc Grind liner face of rod and cap	Disc Grinder (Cadillac) Carborundum Disc
Drill bolt holes in rod and cap	Natco Multiple Drill 8 Spindle
Rgh. ream bolt holes in rod and cap	
Mill locating spots on rod and cap	Kent-Owens-Mill No. 2
Spotface bolt holes to cap	Single Spindle-Drill Press
Mill both sides of large end	18 in. Cincinnati Mill
Burr complete rod and cap	
Ream large end and chamfer both sides	Footo-Burt Drill 4 Spindle
Inspect	
Tin and spin babbitt in rod and cap	3 M.C.E. Babbitt Spinning Mach.
Ream bolt holes in rod and cap	
Core drill babbitt to 2.076	Aurora—Drill—Press
Finish mill liner face	12 in. Plain Cincinnati—Mill
Drill long oil hole, thru rod	4 Spindle Avey-Matic Drill—Elec-Control & Hydraulic Control
Drill small oil hole thru large end and burr long oil hole	
Rgh. ream babbitt	Drill-Press—1 Spindle
Semi fin. face and fillet both sides of large end and turn O.D.	24 in. Cincinnati—Drill Press
Press in bushing	
Burnish bushing	
Finish str. for diamond bore	Special Built GMC } Diamond Bore
Diamond bore both ends	
Finish face & fillet babbitt	Ex-Cell-O Spindle
Burnish and polish large brg.	Aurora Drill No. 20 Single Spindle
Bal. weight and stamp	
Sort and rack by weight	2—Toledo Scales
Inspect	Bench—Inspection—100%

# Streamlining for Economy



**S**TREAMLINING for heavy vehicles (road and rail) was advocated in a paper by Lowell H. Brown of the Jaray Streamline Corporation of America, who asserted that it would save approximately \$500 per year in the case of the average 30-passenger interurban bus and approximately \$250 per year in the case of a truck in long-distance haulage. He also gave a table of calculated savings due to the use of streamlined rail equipment. Mr. Brown, in his paper, took occasion to answer objections raised at previous S.A.E. meetings to the use of air-resistance coefficients obtained in wind-tunnel tests. His arguments in support of the validity of wind tunnel tests ran in part as follows:

The scale effect, that is, the Reynolds-number correction, is of no importance on conventional equipment whose resistance follows the V-squared law so closely. For streamlined equipment, by systematically varying the speeds of the tunnel test, the exponent  $n$  can be obtained by logarithmic plotting, and full scale values can be accurately determined.

Ground effect must be reproduced in the wind tunnel, but the usual ground board gives results which are within 5 per cent of the actual road conditions. A moving belt, free from whip, traveling under the model at the same speed as the air, reproduces the full-scale operating ground effect.

Variations in wind direction and

wind velocity in actual operation average out over any extended period. While the effects of side winds do not average out, the average side wind actually has a beneficial effect on streamlined forms.

It is true that the use of the average speed in determining the horsepower-hours required to overcome the air resistance over a certain distance, introduces an error, the total hp-hrs. required being at least 33 per cent greater. But the error applies in the case of conventional as well as in that of streamlined equipment, and as the former will show greater hp-hrs. consumed on the average-speed basis, it must also be penalized more due to the error involved in that method.

It is assumed that wind tunnel models are made sufficiently accurate to reproduce the shape or form of the hull or shell of the full-scale equipment. If this is done, details may be omitted, unless the air resistance of the details themselves is sought. The resistance of any equipment is so largely controlled by its form that, at least in the present state of the art, little attention need be given to resistance caused by details.

The accompanying illustrations show suggested streamlined bus and railcar designs.

## Legislation Retards Designer

**I**NCONSISTENCIES and lack of uniformity of motor truck legislation have placed many burdens on operators and designing engineers, which undoubtedly have resulted in an enormous economic waste, said George T. Hook, editor of *Commercial Car Journal*. Mr. Hook charged that much of the adverse legislation had been passed at the instigation of the railroads, especially measures restricting the pay-load capacities of trucks.

Legislation has had an effect on truck design by restrictions imposed on lengths, widths, axle weights and gross weights. Further effects may be anticipated in the growing tendency to increase the severity of braking requirements and to impose performance requirements of a stringent nature.

Mr. Hook discussed the restrictions one by one and pointed out some of their effects on design. While many restrictions have had a bad effect, the industry does not regard all truck legislation with disfavor. Reasonable legislation has a stabilizing effect, and

there is a feeling within the industry that if it were not for the restraining influence of reasonable legislation, avid operators would instigate the production of vehicular monstrosities which would be sure to lead to oppressive legislative measures. From the industry's standpoint, the most desirable feature in legislation is uniformity. The engineer can usually design to meet a given set of conditions, but his headaches begin when he has to design to meet varying conditions imposed by law in a dozen different states.

The result is a tremendous economic waste, particularly in interstate operation, because the minimum condition imposed by any one of the states operated in virtually becomes the law under which the trucker must operate. Uniform legislation with regard to sizes and weights would allow engineers to so concentrate their skill that the result would be better design than we have today, design meeting the highest standards of safety and mobility.

# The Horizons of Business

By Joseph Stagg Lawrence

## Thoughts on the Philadelphia Affair

**A**N ardent worshipper of the New Deal and its works, one David Stern, publisher of the Philadelphia Record and the New York Evening Post, convinced that the hostility of the American Press to the New Deal had been greatly exaggerated, conducted a one man survey. To his chagrin he discovered that among papers with a circulation of 38 million, no less than 34 had editorial policies which were critical of the light and virtue emanating from Washington. Mr. Stern should take great comfort in the space allotted to the Democratic convention by the press of the land. How far it departed from its orthodox emphasis upon news in treating the convention is not generally appreciated. News is the occurrence of the unexpected. The space and prominence of the display vary directly with the importance of the news and its interest. When a man bites a dog this is certainly unexpected. Such an episode does not rate the front pages because the fate of the nation is not involved, and its average reader doesn't care whether John Smith sinks his teeth in Fido, his mother-in-law or a ham sandwich.

### Not News

The Democratic convention, according to precedent and theory, was a deliberative assembly chosen by the nation's Democrats for the purpose of selecting the candidate who most perfectly embodied Democratic principles and had the best chance of winning the election. The latter is more important than the former, since many of the primary voters were office holders, relief recipients or otherwise dependent upon the government. Cynical scribes reporting the convention pictured the delegates as venal political chorus boys playing their parts in an elaborately staged show whose scenes and sequence were painstakingly planned by Farley, the master technician, and whose finale was inexorably preordained by Caesar. No one could be so poorly informed or so naive as to entertain any doubts regarding the nominee. The element of surprise in the event was

entirely lacking. Though the ritual was impressive in a theatrical way and the nomination politically important, the event was not news by any standards which the profession has observed in this country.

### Taking It Out on Philadelphia

It is, therefore, difficult to account for the space which the press accorded the nomination of Franklin Delano Roosevelt. The nomination of no candidate in American history has been attended with less uncertainty. The newspapers might as well burst forth in flaring headlines announcing the rising of the sun. The press reveals its servility to tradition. The nomination of a candidate for one of the major parties is a momentous event. The normal criteria of news are held in suspense. The most astute commentators and the most gifted word slingers are assigned to the task. The incompetence of the Philadelphia event as a source of copy forced the desperate scribes to exploit the eccentricities of the delegates, the alleged avarice and poor service of the local hostilities, etc. Because the convention lacked the news status to which it was assigned, the City of Brotherly Love was subjected to a searching and on the whole unflattering appraisal by the scribblers from neighboring towns. Though the innkeepers and merchants of Philadelphia may be gratified by the immediate results, the unfavorable publicity which they received may cause them to regret this blatant and highly artificial pageant of the New Deal in the end.

### Harsh Judgment

Editors have treated the Democratic platform ungenerally. Over and above more specific criticisms they aver that the platform reeks with unctuous and ambiguous generalities. In this they are unfair. The Republican platform is by no means a model of precise or unequivocal statement. The standards of expression to which the editor conforms are altogether different from those which the politician must meet. The former may be critical, caustic and colorful. The politician must be

conciliatory, compromising and cautious. He must be all things to many groups and please enough men and women to secure his reelection.

This is no simple task. Particularly for the Democrats. They must not offend a conservative, even chauvinistic South. The political and social theories of the South are pre-Civil War. It has been steadfastly Democratic because the Republican party notions of centralized authority and racial equality have been offensively liberal. Another prop of the party is the spoils organization of Mr. Farley embracing the best (or worst) features of Tammany and extending them to all parts of the United States. A third element which the New Deal woos is the class conscious farmer and the militant laboring man.

The South represents a racial arrogance which neither the Tammany spoils element or the farmer-labor group can tolerate. Tammany on the other hand, represents a frank exploitation of political power which is repugnant to the South and the farmer-labor group. The latter in turn reveals communistic aspirations which stick in the craws of the old South as much as they do in the economically conservative political organizations of the Atlantic seaboard's densely populated centers.

### Try It Yourself

Try to devise a platform that will please and at the same time avoid offense to these three divergent groups. Bear in mind that your job depends upon your ability to secure the active approbation of enough members of these three groups to defeat the candidate of the other party. Such an effort will create an entirely new tolerance for the vices, subterfuges, circumlocution and equivocation of party platforms. It is the nature of the beast. To say that a large part of a platform, Republican or Democratic, is vague, general and indefinite is to say that a leopard has spots.

### A Covenant Within the Family

Paradoxically the Democratic platform should be news because it is not news. It does the expected. It blesses the New Deal and anoints its high



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*provide Balanced  
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Long life, rapid change-over, and consequent low tool cost and operating economy, are direct results of Continental's exclusive driving principle. Drive is by integral formed lugs with annular bearings on each end of the drive, thereby eliminating runout of the cutter.

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priest. It meticulously removes the curse from the broken pledges of the White House incumbent. His promises in 1932 were a covenant, not with the nation, certainly not with the Republicans who voted against him, but rather with the members of his own party. These members now rise to approve his conduct and to initial one by one his departures from the original decalogue of the party. It is an impertinence for Republicans to criticize the alleged failures of the President to abide by promises made to his own fellow party members. With magnificent vehemence and volume, the latter arose at Philadelphia and absolved their generous saint. In their eyes he had done no wrong and violated no pledges.

Bear in mind that the loyal adherents of the President hold that the party platform is an engagement between the President and those who voted for him. If he failed to balance the budget, the failure is serious only if those who voted for him believe themselves to be adversely affected or betrayed. If he failed to maintain the gold standard indictment is the prerogative of Democratic standard bearers. If he has demoralized large groups of workers, if he has appealed to class prejudice, if he has baited the rich, the privilege of lodging complaint resides exclusively in the membership of his own party. This attitude of responsibility to a limited group must be grasped in order to understand the fervent approbation of the New Deal which the Democratic platform breathes.

### A New Corrosion Inhibitor for Zinc

FOR many years zinc has been recognized as the most economical corrosion-inhibiting metal known to industry. In cases where the other properties of the metal or its alloys were adaptable it has been used alone, while in many other cases it has been used as a protective coating over other metals, notably steel. The New Jersey Zinc Company, has now announced a new process for the production of a coating which furnishes auxiliary protection, and thus makes zinc an even more economical metal to use under many conditions.

This new process produces a visible protective coating on zinc or cadmium; and zinc- or cadmium-coated metals which materially reduces the corrosion rate and prevents the formation of white corrosion products under many conditions where they would otherwise form. Known as The New Jersey Zinc

Company's Cronak Process, it has been patented by this Company, but its use is allowed through license agreement with the company. The film is produced by simple immersion in an inexpensive solution after a thorough cleaning and then drying. In appearance the film is not unlike brass, with a greenish-brown iridescence, although this varies considerably with the length of time of immersion and the weight of the film which forms on the surface of the metal.

Fortunately, for industrial production practice, the color and the corresponding weight of coating are direct indications of its protective value. That is, a brown coating, which will be produced by an immersion of from 5 to 10 seconds, will be definitely more protective than a light iridescent coating which could be produced on a zinc alloy die casting in from 1 to 5 seconds.

The solution recommended is one of sodium dichromate and sulfuric acid in water. Although this solution must be fairly carefully controlled, it has been very successfully used in the zinc alloy die casting production lines of several large industrial plants for over two years. It has also been given a successful industrial try-out on zinc-coated steel.

The largest applications made of the Cronak Process up to the present time have been on carburetors and automobile locks. Both of these parts have been made of zinc alloy die castings for a long time. Formerly a certain amount of sticking in the locks, where tolerances were very small, was undoubtedly due to the formation of white corrosion products by condensed moisture. However, since the use of the Cronak Process has become general practice, in the production of these die cast locks, sticking trouble is said to have been eliminated.

The clogging of carburetor jets was sometimes blamed on the corrosion products of zinc. These products had been observed in the carburetor bowls, and although many other factors were present, these salts may have caused some of the trouble. Since the wide application of the Cronak Process to die-cast carburetor production, this factor has been virtually removed as a possible cause of this difficulty.

A survey by The New Jersey Zinc Company of the possible use of the film formed by the Cronak Process in improving the life of hot-dip galvanized coatings has revealed some very interesting facts. In such investigations the corrosion is usually measured as the loss of weight of a specimen after exposure. In this particular test, after an outdoor exposure of two years, an untreated specimen had lost 40 per cent more weight than one which had been

subjected to the Cronak Process. Even this startling improvement does not give a completely correct story, for the weight of the corrosion products clinging to the untreated specimen, which were not present on the treated one, would throw a slight advantage to the untreated specimen. From this it is easy to see the value of this immersion treatment in slowing up the natural rate of corrosion.

Other industrial applications which have already been made on zinc-alloy die castings are principally in fuel-handling devices. Several parts in a

popular gasoline pump have been given this treatment. It is also being applied to faucets for oil barrels. The practical advantage of the Cronak Process on these applications, however, has not been fully determined.

The principal commercial application of the Cronak Process on zinc coatings is on the brake parts on the 1936 models of one of the high production automobiles. In this case, too, it is too early to forecast the added life afforded by the use of this process, but it is said to have proven of undoubted benefit during the past hard winter.



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Physical soundness — correct hardness — size accuracy and sphericity are guaranteed in all Strom Balls.

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## No Fuel Quantity Limits at Indianapolis Race Next Year

There will be no limit as to the amount of fuel used by cars competing in the annual 500-mile race at the Indianapolis Motor Speedway next May 30, but it must come from the same pump that serves the motoring public, it was decided by the rules committee of the contest board of the American Automobile Association, at its annual meeting in Indianapolis this week.

During the past three years the quantity of fuel consumed has been restricted but there has been no regula-

tion as to the type of gasoline used. Under the new rules the test will be more direct, officials declare. The rule requiring two-men cars at Indianapolis with riding mechanics was maintained as were the general specifications of the racing cars.

## Bugbee and Hadcock Named To Waukesha Motor Board

Benjamin C. Bugbee, industrialist and engineer, associated with Cahill & Co., consulting engineers of Milwaukee, and Dr. M. A. Hadcock of Waukesha, were elected at the last meeting of the

board of directors of the Waukesha Motor Co. to fill the vacancies left by the deaths of H. L. Horning and A. S. Cronk. Doctor Hadcock has been intimately connected with the development of the company since its organization in 1906, and represents substantial investment interests in the corporation.

Benjamin C. Bugbee has had wide experience as an industrialist and engineer. As an engineer for the T.M.E.R.&L. Co. he played a substantial part in the building of their powerplant and substation system throughout the southeastern section of Wisconsin which this company serves. Later he left this organization to become a consulting engineer with the firm of Cahill & Co.

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*Derma-San is ideal for all general plant sanitation*

The HUNTINGTON LABORATORIES Inc.

DENVER

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TORONTO

## Seventeen States Have 82% of Farm Tractors

Eighty-two per cent of all farm tractors in the United States on April 1 were concentrated in 17 states. This is shown by a survey that has just been completed by Harry G. Davis, head of the research and statistical information bureau of the Farm Equipment Institute.

Eleven of the 17 leading states are in the Middle Western corn and wheat belts. The total units in use in the 17 states are given as 1,025,497. In the other 31 states the total of farm tractors is only 222,840.

Illinois farmers lead the country, with 108,007 units. Nevada, with only 393 units, is last. The 17 leading states and the number of units in service are: Illinois, 108,007; Iowa, 97,608; Kansas, 79,831; Texas, 73,981; Ohio, 66,471; Minnesota, 65,419; Indiana, 63,726; Wisconsin, 62,512; Nebraska, 56,107; California, 55,192; New York, 50,807; North Dakota, 45,129; Michigan, 45,040; Pennsylvania, 42,258; South Dakota, 40,833; Missouri, 37,572; Oklahoma, 35,004.

## Page Upholds Autocar's Factory Branch System

*(Continued from page 9)*

necessity than choice. Because the relative volume is low, and the shop equipment required is costly, the heavy duty truck field is not attractive to the average dealer.

The highly developed factory branch, each with a manager who enjoys nearly all the freedom of an independent business enterprise, is Autocar's answer to the problem. It is the company's belief that it should "drive with a loose rein" as far as control of managers is concerned. Active contact between managers and the company and between managers themselves is maintained through monthly meetings in Ardmore, to which all managers come several times during a year. Here new policies are evolved, and in most cases are submitted to the individual managers for adoption.



## 32 States to Make Tests Of Cotton in Roadbuilding

Requests for cotton fabric and cotton mats to be used in tests of new uses of cotton in highway construction have been made by 32 States, the Agricultural Adjustment Administration announced today.

Requests for approximately 6,167,000 sq. yd. of cotton fabric for use as a reinforcement membrane in bituminous surface-treated highways were filed by 24 of the 32 States. Estimates indicate that this material is to be used in the construction of more than 575 miles of road.

A total of 23 of the 32 States filed requests for more than 89,500 cotton mats for use in curing concrete highways.

The project is being financed with funds made available by section 32 of the amendments to the Agricultural Adjustment Act, approved last August. This section makes available to the Secretary of Agriculture an amount equal to 30 per cent of the customs receipts for uses which include the encouragement of domestic consumption of agricultural commodities by diverting them from normal channels of trade to new uses.

## Waukesha Dividend Date Changed by New Tax Law

Stockholders of the Waukesha Motor Co. have just been informed that by recent action of the board of directors, the regular dividend due July 1, 1936, will be paid Aug. 3, 1936, to stockholders of record July 15. This postponement is expected to result in savings to the stockholders and, accordingly, an extra dividend of 5c. per share on the \$5 par common stock will also be paid at that time. The provisions of the recently enacted Federal Corporation Income Tax Law affecting corporation earnings is given as the reason for the change in the dividend date from July 1 to Aug. 3.



"Corrosion-Protective Value of Electro-deposited Zinc and Cadmium Coatings on Steel," by William Blum, W. C. Strausser and Abner Brenner. Research paper No. RP867, available from the National Bureau of Standards, Washington, D. C.

Johnson Bronze Co.'s automotive service parts catalog No. 38\* features the company's complete line of automotive bushings plus a full line of universal bronze bars completely machined and furnished in cored and uncored sizes.

Details of the Oshkosh 4-wheel-drive Earth Mover are given in the company's new literature\* describing this unusual equipment. Up to 15 cu. yds. can be moved on a single load.

"Industry and the Public,"\* an address

by Eugene G. Grace, President of the Bethlehem Steel Corp. and of the American Iron and Steel Institute, in defence of the profit system, given before the Institute of May 28, 1936.

Wrought Washer Mfg. Co., Milwaukee, Wis., has announced a new slide rule which automatically calculates weight per thousand pieces or pieces per pound of any size washer in any material. It will be mailed gratis on written request to manufacturer.

A new bulletin\* of the Production Instrument Co. describes their new Type Es-9 pilot switch for automatic control. Pressure of only 1/2 ounce is required to operate the switch.

Description and uses for the Johansson Gage Block sets have recently been received. Also a complete table of constants for use with the Johansson Sine Bar. Copies are available from the Ford Motor Co., or from AUTOMOTIVE INDUSTRIES.

Literature\* regarding the Master "A" Series, the new small size presses by the Niagara Machine and Tool Works, Buffalo, has just been issued. Comparisons show

the similarity between this and the heavier lines.

Monarch Machine Tool Co., Sydney, Ohio, has recently completed catalog inserts\* of more than usual interest regarding the hydraulic multi-speed lathe and the cam-lock flanged spindle. Full description together with operating applications are contained.

A new complete catalog\* has just been released by the International Piston Ring Co. covering the company's full line for passenger cars and trucks.

The complete line of Garrison dry-method fire fighting equipment is described in the new catalog\* issued by Garrison Engineering Corp., Great Barrington, Mass.

"How to Cut Screw Threads in the Lathe" and "How to Grind Lathe Tool Cutter Bits" are subjects of recent publications by the South Bend Lathe Works, South Bend, Ind. Each is a complete treatise in its field. Available from the publishers at a cost of 10 cents per copy.

\*Available from AUTOMOTIVE INDUSTRIES.

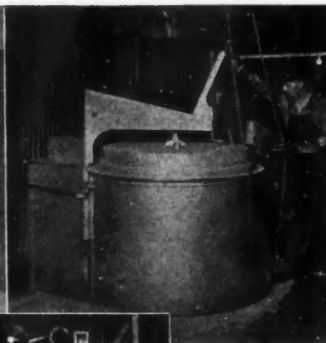
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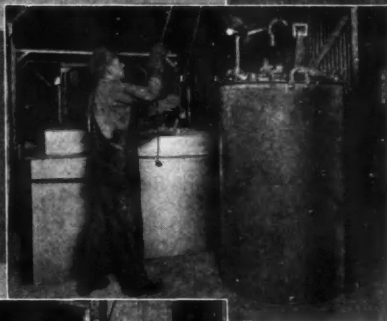
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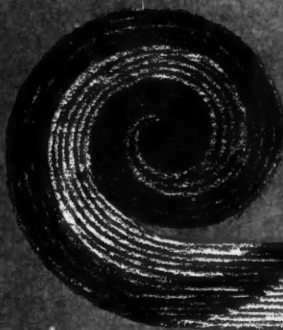


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